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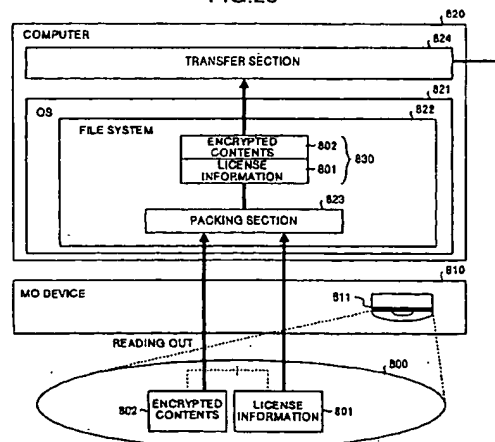
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(54) Content access control

(57) A content access control system comprising: a read unit (810) which reads out content (802) and license information (801) from a medium (800) where the content to be provided from an authenticated information provider to a user and the license information regarding access to the content are recorded in correlation with each other; a transfer unit (824) which transfers the read-out content and license information; a reception unit (924) which receives the read-out content and license information; and a write unit (910) which generates the content and the license information from the read-out content and license information received by the reception unit, and writes the generated content and license information onto another medium (900); characterized in that: the transfer unit (824) transfers the read-out content (802) and license information (801) as a file; the reception unit (924) receives the file; the write unit (910) generates the contents and the license information from the file, items of identifying information being allocated to two or more of the read unit (810), transfer unit (824), reception unit (924) and write unit (910), respectively; the license information (242) recorded in the medium (240) includes two or more blocks of license information each of which includes a respective item of said identifying information; the blocks of license infor-

mation are subjected to multiple encryption by setting a logical product of the identifying information included in the blocks of license information; and the system allows access to the content (802) only when the decrypted license information satisfies the logical product.

FIG.26



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Description

[0001] The present invention relates to a content access control system which controls access to content provided by an authenticated information provider such as a copyright holder. This invention also relates to a content access control method/program and a computer-readable recording medium where the content access control program is recorded.

[0002] Under present circumstances where distribution of content such as digitized movies and music has started in earnest, it is urgently required to realize a mechanism to manage copyrights and licenses concerning this type of content.

[0003] One can not sell or transfer content such as movies or music (that is, material that has a copyright) in order to make profit, unless licensed to do so by the copyright holder under the provisions of copyright law. "Content" here refers to copyrighted works in digital form, such as a collection of bit arrays recordable on a single piece of recording media, such as documents, still images, video, and software programs.

[0004] This type of content can be distributed to users by recording it on one or more recording media. In this case, controls for access to the content (henceforth, content access control) are provided using license information for the purpose of protection of the copyrights. This contents access control is provided in order that only an authorized user can get access to the content.

[0005] As an example of content access control, there is one realized by using license information consisting of identifying information that identifies each of physical elements (that is, system elements such as recording media, device) required for accessing the content. This license information includes license conditions for access to the content. Such a system has identifying information allocated specifically to that system. A user gets the license information from a channel different from a channel from where he gets the content. The user then inputs the license information into the system, and sets the recording media, that contains the content, into this system.

[0006] The system determines whether the identifying information allocated to the system satisfies the license conditions included in the license information entered by the user. When the information satisfies the license conditions, access to the content is allowed. On the other hand, when the information does not satisfy the license conditions, the access to the content is not allowed.

[0007] As explained above, when accessing content in a conventional manner, it is required to acquire both the recording media that contain the content and the license information from different channels, which is extremely inconvenient. Further, the recording media and the license information exist separately, which may cause either of the two to be lost in the conventional system.

[0008] Further, conventionally, only the license information exists as a single unit. Therefore, unauthorized duplication of the license information is possible, and as a result, there has been a problem that unauthorized access to the content may occur. This is not good from the viewpoint of protection of copyright holders.

[0009] EP-A-0 878 796 discloses a content access control apparatus, system and method in which encrypted content and encrypted license information of the content are inseparably recorded on a medium such as a DVD. Decoding of the encrypted license information may be performed using a secret key present in a decoder unit.

[0010] EP-A-0 923 076 discloses a data recording apparatus having an encoder ID specific to the apparatus. The encoder ID is recorded on a medium together with encoded data so as to prevent reproduction of copied data.

[0011] EP-A-0 717 338 discloses a method of protecting copyright in which each copy of a work is restricted to a specific device or set of devices, by giving each playback device an identification number and providing a licence for unlocking the work which includes that identification number.

[0012] Embodiments of this invention can provide a content access control system which allows a user to easily transfer content and licence information from one medium to another while preventing unauthorized access to the content, and also provide a content access control method/program and a computer-readable recording medium that contains the content access control program.

[0013] According to one aspect of this invention, there is provided a content access control system comprising: a read unit which reads out content and license information from a medium where the content to be provided from an authenticated information provider to a user and the license information regarding access to the content are recorded in correlation with each other; a transfer unit which transfers the read-out content and license information; a reception unit which receives the read-out content and license information; and a write unit which generates the content and the license information from the read-out content and license information received by the reception unit, and writes the generated content and license information onto another medium; characterized in that: the transfer unit transfers the read-out content and license information as a file; the reception unit receives the file; the write unit generates the contents and the license information from the file, items of identifying information being allocated to two or more of the read unit, transfer unit, reception unit and write unit, respectively; the license information recorded in the medium includes two or more blocks of license information each of which includes a respective item of said identifying information; the blocks of license information are subjected to multiple encryption by setting a logical product of the identifying information included in the

blocks of license information; and the system allows access to the content only when the decrypted license information satisfies the logical product.

[0014] According to a second aspect of this invention, there is provided a content access control method comprising the steps of: reading out content and license information from a medium where the content to be provided from an authenticated information provider to a user and the license information regarding access to the content are recorded in correlation with each other; transferring the read-out content and license information; receiving the read-out content and license information; and generating the received content and the license information, and writing the generated content and license information onto another medium; characterized in that the method further comprises the steps of: transferring the read-out content and license information as a file; allocating respective items of identifying information to physical elements included in a utilization unit for carrying out said method; setting the license information recorded in the medium so as to include two or more blocks of license information allocated to said physical elements respectively, wherein the blocks of license information include respective items of said identifying information allocated to the physical elements; performing multiple encryption for the license information by setting a logical product of the identifying information included in the blocks of license information; and allowing access to the content only when the decrypted license information satisfies the logical product.

[0015] In an embodiment of the invention, license information (information indicating whether access to the content is to be allowed or not) and the content are stored in one medium in a correlated form. The access to the content is controlled based on the license information and identifying information. Therefore, by acquiring the medium, both the license information and the content can concurrently be obtained. Resultantly, the content can more easily be utilized as compared to the conventional case where the license information and the content are acquired from different channels.

[0016] Further, the access control unit decrypts the blocks of license information acquired from the medium, and controls access to the content based on these results of decryption and the identifying information. Only a user who has the right can decrypt all the blocks of license information. Therefore, the case where the blocks of license information cannot be decrypted indicates the fact that the corresponding device belongs to an unauthorized user. As a consequence, unauthorized access to the content can be prevented.

[0017] Preferably, the content is also encrypted. The access control unit decrypts the blocks of license information acquired from the medium, and controls access to the content based on these results of decryption and the identifying information. Only the user who has the right can decrypt all the blocks of license information and the content decryption key. Further, when the access is

licensed by the access control unit, the utilization unit utilizes the content based on the result of decrypting the content using the content decryption key. As a consequence, unauthorized access to the content can be prevented.

[0018] In one embodiment, the access control unit controls access to the content based on the result of decrypting the license information recorded on the secured region and the identifying information. Only a user who has the right can decrypt the license information. Therefore, the case where the license information cannot be decrypted indicates the fact that the corresponding device belongs to an unauthorized user. As a consequence, unauthorized access to the content can be prevented.

[0019] In another embodiment, the physical elements of the utilization unit perform mutual authentication when a mutual authentication command is issued. When the elements are mutually authenticated, the access control unit acquires license information from the specific region, and controls access to content based on the license information and the identifying information. When the physical elements are not mutually authenticated, on the other hand, the access is not licensed. Thus, the license can be disapproved at the instant at which it is determined that mutual authentication is not obtained. As a consequence, unauthorized access to the content can be prevented.

[0020] Further, the secured region may be mapped to the specific region, both of which are effective in security. Therefore, extremely high security can be ensured.

[0021] The present invention allows content and license information to be transferred (copied) from one medium to the other. Therefore, the license regarding the access to the content can be transferred to a third party.

[0022] Although a medium is referred to above, it is possible for the content and the license information to be distributed over a plurality of media.

[0023] Reference is made, by way of example, to the accompanying drawings in which Figures 26 and 27 particularly relate to the present invention, the remaining Figures being relevant at least as background information. In the Figures:

Fig. 1 is a block diagram showing a first content access control system useful for understanding this invention.

Fig. 2 is a diagram showing a relationship between the content 141 and the AC 142 shown in Fig. 1.

Fig. 3 is an example of the format of the AC 142 shown in Fig. 1.

Fig. 4 is a flow chart showing the operation of the system of Fig. 1.

Fig. 5 is a block diagram showing the configuration of a second content access control system.

Fig. 6 is a diagram showing a relationship between the content 241 and the license information 242

shown in Fig. 5.

Fig. 7 shows an example of the format of the AC 242 shown in Fig. 5.

Fig. 8A to Fig. 8F show examples of the license information 242 shown in Fig. 5.

Fig. 9 is a flow chart showing the operation of the second content access control system.

Fig. 10 is a block diagram showing the configuration of a third content access control system.

Fig. 11 shows an example of the license according to the third content access control system.

Fig. 12A to Fig. 12F show examples of the license information 300 shown in Fig. 10.

Fig. 13 is a flow chart showing the operation of the third content access control system.

Fig. 14 is a block diagram showing the configuration of a fourth content access control system.

Fig. 15 is a diagram showing the data structure of the MO media 440 shown in Fig. 14.

Fig. 16 is a flow chart showing the operation of the fourth content access control system.

Fig. 17 is a flow chart showing the operation of the fourth content access control system.

Fig. 18 is a block diagram showing the configuration of the data write device in the fourth content access control system.

Fig. 19 is a flow chart showing the operation of the data write device shown in Fig 18.

Fig. 20 is a block diagram showing the configuration of a fifth content access control system.

Fig. 21 is a diagram showing the data structure of the MO media 540 shown in Fig. 20.

Fig. 22 is a flow chart showing the operation of the fifth content access control system.

Fig. 23 is a block diagram showing the configuration of the formatting device in the fifth content access control system.

Fig. 24 is a flow chart showing the operation of the formatting device shown in Fig 23.

Fig. 25 is a diagram showing the data structure of the MO media 600 in a sixth content access control system.

Fig. 26 is a block diagram showing the configuration of the packed data generating device in an embodiment of this invention.

Fig. 27 is a block diagram showing the configuration of the unpacking device in the embodiment.

[0024] In the following detailed description, content such as copyrighted information, software and the like is referred to as "contents".

[0025] Before describing a preferred embodiment of the content access control system, method and program, some content access control systems useful for understanding the invention will first be explained.

[0026] Fig. 1 is a block diagram showing a configuration of a first content access control system useful for understanding this invention. A user U operates a com-

puter 110. The computer 110 comprises OS (Operating System) 111. The OS 111 controls execution of various programs in this computer 110. File system 112 manages files handled by the computer 110, and controls read/write of data. ACM (Access Control Manager) 113 manages controls for access between the ACM and each of the file system 112, MPEG2 (Moving Picture Experts Group 2) playback control section 114, MO (Magneto Optic) device 120 (i.e. MO disk drive), and MPEG2 decoder 130.

[0027] The MPEG2 playback control section 114 provides controls for supplying data for moving pictures (contents) to the MPEG2 decoder 130. In reality, the functions of the MPEG2 playback control section 114 are realized by executing an MPEG2 playback control application program. The MO device 120 is provided externally (or internally), and reads out data from a medium (an MO disc 140 in Fig. 1).

[0028] Contents 141 and AC (Access Condition: Information representing access approval condition) 142 are stored on the medium 140 in a correlated form. The contents 141 are data for MPEG2-format moving pictures, for example, and are provided by the information provider such as the copyright holder. The data format of the contents 141 is immaterial so long as the data is subject to copyright or a license. The AC 142 is license information regarding the playback of the contents 141. The playback of the contents 141 is allowed when the provided data satisfies the condition of the AC 142. Whereas, the playback of the contents 141 is not allowed when the data does not satisfy the conditions of the AC 142.

[0029] The condition of the AC 142 consists of a combination of respective identifying information allocated to a plurality of target physical elements. This target physical element includes any device and media, such as MO media, MO device, and MPEG2 device, that are required to playback the contents 141. Identifying information includes MSN (Media Serial Number) and a DSN (Device Serial Number). It will be assumed here that the AC 142 has the MSN of the MO media set to "123", the DSN of the MO device set to "456", and the DSN of the MPEG2 decoder set to "789". Further, the condition for a logical product (AND): MSN (=123) & DSN (=456) & DSN (=789) is set in the AC 142.

[0030] That is, according to the AC 142, the playback of the contents 141 can be licensed only when all of three conditions are satisfied: the MO media are ones to which the MSN (=123) is allocated, the MO device is one to which the DSN (=456) is allocated, and the MPEG2 decoder is one to which the DSN (=789) is allocated. Conversely, playback of the contents 141 is not allowed when one or two conditions out of the three conditions are not satisfied. Thus, the AC 142 plays a role as a license to give approval of playback of the contents 141 only to an authorized party who can simultaneously satisfy the three conditions.

[0031] The contents 141 and the AC 142 are stored

on the MO media 140 in a correlated form as shown in Fig. 2. The contents 141 of the MO media 140 are divided into three blocks: contents (1/3) 141₁, contents (2/3) 141₂, and contents (3/3) 141₃. These contents (1/3) 141₁, contents (2/3) 141₂, contents (3/3) 141₃ are stored in regions specified by LBN (Logical Block Number)=L, LBN=M, and LBN=N, respectively.

[0032] Similarly, the AC 142 of the MO media 140 is divided into two blocks: AC (1/2) 142₁, and AC (2/2) 142₂. These AC (1/2) 142₁ and AC (2/2) 142₂ are stored in regions specified by LBN=X and LBN=Y, respectively.

[0033] The contents 141 and the AC 142 are correlated with each other via file management data D_{A1} and auxiliary file management data D_{A2}. The file management data D_{A1} is used for managing the contents 141 as the main body of the file and the AC 142 as an auxiliary file. This file management data D_{A1} consists of information such as "file name", "date and time of creation", ..., "link to the auxiliary file management data", "link to main body of the file (1/3)", "link to main body of the file (2/3)", and "linkage to main body of the file (3/3)".

[0034] On the other hand, the auxiliary file management data D_{A2} is used for directly managing the AC 142, and consists of information such as "auxiliary file name", "date and time of creation", ..., "link to AC (1/2)", and "link to AC (2/2)".

[0035] Fig. 3 shows an example of the format of the AC 142. In this figure, flag F₄ represents the fact that a medium AC: MSN=123 does not satisfy the condition for logical sum (OR)/logical product (AND). Flag F₅ represents the fact that the MO device AC: DSN=456 (see Fig. 1) does not satisfy the condition for logical sum/logical product (the slash / represents 'or'). Flag F₃ represents the fact that the medium AC: MSN=123 and the MO device AC: DSN=456 satisfy the conditions of a logical sum. In this case, the number of conditions for a logical sum is 2.

[0036] Flag F₆ represents the fact that MPEG2 decoder AC: DSN=789 does not satisfy the condition for logical sum/logical product. Flag F₂ represents the fact that the elements with regard to flag F₃ (MSN=123, DSN=456) and the element with regard to flag F₆ (DSN=789) satisfy the conditions for the logical sum. In this case, the number of conditions for the logical sum is 2. Formats from the flag F₂ to the flag F₆ are used here for the AC 142 shown in Fig. 1. Thus, flag F₁ and flag F₇ to flag F₉ shown in Fig. 3 are used for extension.

[0037] Flag F₈ represents the fact that medium AC: MSN=abc does not satisfy the condition for logical sum/logical product. Flag F₉ represents the fact that MO device AC: DSN=def does not satisfy the condition for logical sum/logical product. Flag F₇ represents the fact that the element (MSN=abc) with regard to flag F₈ and the element (DSN=def) with regard to flag F₉ satisfy the conditions for logical product. The number of conditions for the logical product in this case is 2. Flag F₁ represents the fact that the elements (MSN=123, DSN=456, DSN=789) with regard to flag F₂ and the elements

(MSN=abc, DSN=def) with regard to flag F₇ satisfy the conditions for a logical sum. In this case, the number of conditions for the logical sum is 2.

[0038] Referring to Fig. 1, MSN=123 is allocated to the medium 140 as media identifying information. DSN=456 is allocated to the MO device 120 as device identifying information. A drive 121 drives the medium 140 so as to rotate the medium at the time of reading out the data. AC check section 122 checks whether the MSN=123 read-out from the medium 140 satisfies the condition (in this case, MSN=123) of the AC 142. Similarly, the AC check section 122 checks whether the DSN=456 allocated to the MO device 120 satisfies the condition (in this case, DSN=456) of the AC 142.

[0039] The MPEG2 decoder 130 decodes the contents 141 (for example, video data) based on the MPEG2 format and plays back the contents 241. DSN=789 is allocated to this MPEG2 decoder 130 as device identifying information. The AC check section 131 checks whether the DSN=789 satisfies the condition (in this case, DSN=789) of the AC 142.

[0040] MO device 150 is provided separately from (may be provided together with) the MO device 120 and reads out data from a MO disk (medium 160 in Fig. 1). Drive 151 in this MO device 150 drives the medium 160 so as to rotate. Further, DSN=def (see Fig. 3) is allocated to the MO device 150 as device identifying information. This DSN=def is different from the DSN=456 allocated to the MO device 120. MSN=abc is allocated to the medium 160 as media identifying information. This MSN=abc is different from the MSN=123 allocated to the medium 140.

[0041] Operation of the Fig. 1 system will be explained below with reference to a flow chart shown in Fig. 4. It is assumed here that the medium 140 is set in the drive 121 of the MO device 120. When the user U instructs playback of MPEG2 contents to the MPEG2 playback control section 114 at step SA1, at the next step SA2 the MPEG2 playback control section 114 instructs the playback of the MPEG2 contents to the ACM 113.

[0042] Accordingly, at step SA3, the ACM 113 acquires the AC 142 from the medium 140 via the file system 112. At step SA4, the ACM 113 transfers the acquired AC 142 to the AC check section 122 of the MO device 120. At step SA5, the AC check section 122 then acquires the MSN (=123) from the medium 140. At step SA6, the AC check section 122 determines whether the condition of the AC 142 matches the MSN (=123).

[0043] Precisely, the AC check section 122 determines whether the contents of the AC 142 (in this case, medium : MSN=123) shown in Fig. 1 match the MSN (=123) acquired from the medium 140. Assume that the two match. Therefore, the result of determination at step SA6 shall be "Yes".

[0044] On the other hand, when the result of determination at step SA6 is "No", namely when the two do not match, the processes in step SA17 is performed. At step SA17, the AC check section 122 sends the check result

of NG (no match) back to the ACM 113. Accordingly, at step SA18, the ACM 113 sends the check result of NG back to the MPEG2 playback control section 114, and ends the series of processing. This case indicates that the condition of the AC 142 (MSN=123) is not satisfied, and hence the playback of the contents 141 recorded on the medium 140 is not allowed.

[0045] When the result of determination at step SA6 is "Yes", at step SA7, the AC check section 122 returns the AC 142 together with the check result of OK (match) obtained at step SA6 to the ACM 113. Accordingly, at step SA8, the ACM 113 transfers the AC 142 to the AC check section 122. When receiving the AC 142, at step SA9, the AC check section 122 acquires DSN (=456) from the MO device 120. At step SA10, the AC check section 122 determines whether the condition of the AC 142 matches the DSN (=456).

[0046] Precisely, the AC check section 122 determines whether the contents of the AC 142 (in this case, MO device: DSN=456) shown in Fig. 1 match the DSN (=456) acquired from the MO device 120. Assume that the two match. Therefore, the result of determination at step SA10 will be "Yes".

[0047] On the other hand, when the result of determination at step SA10 is "No", the process at step SA17 is performed. At step SA17, the AC check section 122 sends the check result of NG back (no match) to the ACM 113. Accordingly, at step SA18, the ACM 113 sends the check result of NG back to the MPEG2 playback control section 114, and ends the series of processing. Thus, this case indicates that the conditions of the AC 142 (MSN=123 & DSN=456) are not satisfied, and hence the playback of the contents 141 recorded on the medium 140 is not allowed.

[0048] When the result of determination at step SA10 is "Yes", at step SA11, the AC check section 122 returns the AC 142 together with the check result of OK (match) obtained at step SA10 to the ACM 113. Accordingly, at step SA12, the ACM 113 transfers the AC 142 to the AC check section 131 of the MPEG2 decoder 130. When receiving the AC 142, at step SA13, the AC check section 131 acquires DSN (=789) from the MPEG2 decoder 130. At step SA14, the AC check section 131 determines whether the condition of the AC 142 matches the DSN (=789).

[0049] Precisely, the AC check section 131 determines whether the contents of the AC 142 (in this case, MPEG2 decoder: DSN=789) shown in Fig. 1 match the DSN (=789) acquired from the MPEG2 decoder 130. Assume that the two match. Therefore, the result of determination at step SA14 will be "Yes".

[0050] On the other hand, when the result of determination at step SA14 is "No", the process at step SA17 is performed. At step SA17, the AC check section 131 sends the check result of NG (no match) back to the ACM 113. Accordingly, at step SA18, the ACM 113 sends the check result of NG back to the MPEG2 playback control section 114, and ends the series of

processing. Thus, this case indicates that the conditions of the AC 142 (MSN=123 & DSN=456 & DSN=789) are not satisfied, and hence the playback of the contents 141 recorded on the medium 140 is not allowed.

[0051] When the determination result at step SA14 is "Yes", at step SA15, the AC check section 131 returns the AC 142 together with the check result of OK (match) obtained at step SA14 to the ACM 113. Accordingly, at step SA16, the ACM 113 sends all the check results of OK obtained at step SA6, step SA10, and step SA14 back to the MPEG2 playback control section 114, and ends the series of processing. Thus, this case indicates that all the conditions of the AC 142 recorded on the medium 140 are satisfied, and hence retrieval of contents 141 is allowed.

[0052] Therefore, the MPEG2 playback control section 114 reads out the contents 141 from the MO media 140 via the drive 121 and the file system 112, and then transfers the contents to the MPEG2 decoder 130. Accordingly, the contents 141 are decoded and played as video by the MPEG2 decoder 130.

[0053] As explained above, in the above system, the AC 142 and the contents 141 are recorded in a correlated form on one medium 140, and access to the contents 141 is controlled based on the AC 142 and the identifying information (MSN=123, and so on). Therefore, the AC 142 and the contents 141 can simultaneously be obtained when the medium 140 is acquired. Thus, contents can more easily be utilized as compared to the conventional case where these two are acquired through different channels.

[0054] In the system shown in Fig. 1, the AC 142 was not encrypted. However, higher security may be achieved when the AC 142 is encrypted. This case is explained below as a second content access control system.

[0055] Fig. 5 is a block diagram showing a configuration of the content access control system. The user U operates the computer 210. The computer 210 comprises OS 211. The OS 211 controls execution of various programs in this computer 210. File system 212 manages files handled by the computer 210, and controls read/write of data. ACM (Access Control Manager) 213 manages controls for access between the ACM and each of the file system 212, MPEG2 playback control section 214, MO device 220, and MPEG2 decoder 230.

[0056] The MPEG2 playback control section 214 has the same function as that of the MPEG2 playback control section 114 (see Fig. 1). The MO device 220 is provided externally (or internally), and reads out data from MO disks (medium 240 in Fig. 5).

[0057] Contents 241 and license information 242 are stored on the medium 240 in a correlated form. The contents 141 are data for MPEG2-format moving pictures. The license information 242 is information regarding whether the playback of the contents 241 is allowed or not. That is, when provided data satisfies the conditions of the license information 242 then the playback of the

contents 241 is allowed. Whereas, when the data does not satisfy the conditions of the license information 242, the playback of the contents 241 is not allowed. This license information 242 is obtained by performing multiple encryption on items of information (MSN=123, DSN=456, and DSN=789) by a plurality of encryption keys. The detailed data structure of this license information 242 is explained later with reference to Fig. 7.

[0058] The condition of the license information 242 consists of a combination of respective identifying information allocated to a plurality of target physical elements. This target physical element includes any device and media, such as MO disks, MO device, and MPEG2 device, that are required to play back the contents 241. Identifying information includes MSN (Media Serial Number) and DSN (Device Serial Number). Precisely, the license information 242 has the MSN of the MO media set to "123", the DSN of the MO device set to "456", and the DSN of the MPEG2 decoder set to "789". Further, the condition for a logical product (AND): MSN (=123) & DSN (=456) & DSN (=789) is set in the license information 242.

[0059] That is, according to the license information 242, the playback of the contents 241 can be allowed only when all of three conditions is satisfied: the MO media are ones to which the MSN (=123) is allocated, the MO device is one to which the DSN (=456) is allocated, and the MPEG2 decoder is one to which the DSN (=789) is allocated. Conversely, when one or two conditions out of the three conditions are not satisfied, access to the data (contents) 241 is not allowed. Thus, the license information 242 plays a role as a license to give approval of the playback of the contents 241 only to an authorized party who can simultaneously satisfy the three conditions.

[0060] The contents 241 and the license information 242 are stored on the MO media 240 in a correlated form as shown in Fig. 6 in the same manner as that of Fig. 2. The contents 241 of the MO media 240 are divided into three blocks: contents (1/3) 241₁, contents (2/3) 241₂, and contents (3/3) 241₃. These contents (1/3) 241₁, contents (2/3) 241₂, contents (3/3) 241₃ are stored on regions specified by LBN=L, LBN=M, and LBN=N, respectively.

[0061] Similarly, the license information 242 of the MO media 240 is divided into two blocks: license information (1/2) 242₁, and license information (2/2) 242₂. These license information (1/2) 242₁ and license information (2/2) 242₂ are stored on regions specified by LBN=X and LBN=Y, respectively.

[0062] The contents 241 and the license information 242 are correlated with each other via file management data D_{B1} and auxiliary file management data D_{B2}. The file management data D_{B1} is used for managing the contents 241 as the main body of the file and the license information 242 as an auxiliary file. This file management data D_{B1} consists of information such as "file name", ..., "link to the main body of file (3/3)". On the

other hand, the auxiliary file management data D_{B2} is used for directly managing the license information 242, and consists of information such as "auxiliary file name", ..., "link to the license information (1/2)", and "link to the license information (2/2)".

[0063] Referring to Fig. 5, MSN=123 is allocated to the MO media 240 as media identifying information. Key=abc is also stored on the MO media 240. This Key=abc is used for decrypting the MSN=123 from the license information 242. DSN=456 is allocated to the MO device 220 as device identifying information. Key=def is also stored in the MO device 220. This Key=def is used for decrypting the DSN=456 from the license information 242.

[0064] A drive 221 drives an MO disk 240 so as to rotate the disk at the time of reading out data. A decryption section 223 decrypts the MSN=123 from the license information 242 using the Key=abc stored on the MO disk 240. Further, the decryption section 223 decrypts the DSN=456 from the license information 242 using the Key=def stored in the MO device 220.

[0065] AC check section 222 checks whether the MSN=123 read-out from the MO disk 240 satisfies the condition (in this case, MSN=123) of the license information 242. The AC check section 222 also checks whether the DSN=456 allocated to the MO device 220 satisfies the condition (in this case, DSN=456) of the license information 242.

[0066] The MPEG2 decoder 230 decodes the contents 241 (data for moving pictures) in accordance with the MPEG2 format to reproduce the contents 241. DSN=789 is allocated to this MPEG2 decoder 230 as device identifying information. A decryption section 232 decrypts the DSN=789 from the license information 242 using Key=ghi stored in the MPEG2 decoder 230. AC check section 231 checks whether the DSN=789 satisfies the condition (in this case, DSN=789) of the license information 242.

[0067] Fig. 7 shows an example of a license (license information 242) in the above system. MPEG2 decoder AC: DSN=789 that corresponds to the MPEG2 decoder as the target physical element, is encrypted by the Key=ghi. Further, the DSN=789 is the license information for the MPEG2 decoder 230.

[0068] MO device AC: DSN=456 corresponds to the MO device as a target physical element. This DSN=456 and the encrypted DSN=789 are subjected to multiple encryption using the Key=def. These DSN=456 and DSN=789 subjected to multiple encryption are the license information for the MO device 220. Further, MO media AC: MSN=123 corresponds to the medium as a target physical element. This MSN=123 and both of the DSN=456 and the DSN=789 subjected to multiple encryption are further subjected to multiple encryption using the Key=abc. These MSN=123, DSN=456, and DSN=789 subjected to multiple encryption are the license information for the medium 240.

[0069] Operation of the Fig. 5 system will be explained

below with reference to a flow chart shown in Fig. 9. It is assumed here that an MO disk 240 is set in the drive 221 of the MO device 220. When the user U instructs playback of MPEG2 contents to the MPEG2 playback control section 214 at step SB1 as shown in Fig. 9, at step SB2, the MPEG2 playback control section 214 instructs the playback of the MPEG2 contents to the ACM 213.

[0070] At step SB3, the ACM 213 acquires the encrypted license information 242 shown in Fig. 8A from the MO disk 240 via the file system 212. At step SB4, the ACM 213 transfers the acquired license information 242 to the decryption section 223 of the MO device 220. Accordingly, at step SB5, the decryption section 223 acquires a key (=abc=K1) from the medium 240.

[0071] At step SB6, the decryption section 223 decrypts the license information 242 to that as shown in Fig. 8B using the key (=abc=K1). The MSN (=123) is decrypted here as shown in Fig. 8B. At step SB7, the decryption section 223 transfers the decrypted license information 242 to the AC check section 222.

[0072] At step SB8, the AC check section 222 acquires an MSN (=123) from the medium 240. At step SB9, the AC check section 222 determines whether the condition (MSN=123) of the decrypted license information 242 shown in Fig. 8B matches the MSN (=123). Assume that the two match. Therefore, the result of determination at step SB9 will be "Yes".

[0073] On the other hand, when the result of determination at step SB9 is "No", the process at step SB26 is performed. At step SB26, the AC check section 222 sends the check result of NG (no match) back to the ACM 213. Accordingly, at step SB27, the ACM 213 sends the check result of NG back to the MPEG2 playback control section 214, and ends the series of processing. Thus, this case indicates that the condition for the license (MSN=123) based on the license information 242 is not satisfied, and hence disk replay is prevented.

[0074] When the result of determination at step SB9 is "Yes", at step SB10, the AC check section 222 returns the license information 242 shown in Fig. 8C together with the check result of OK obtained at step SB9 to the ACM 213. Accordingly, at step SB11, the ACM 213 transfers the received license information 242 to the decryption section 223 of the MO device 220. When receiving the license information 242, at step SB12, the decryption section 223 acquires a key (=def=K2) from the MO device 220.

[0075] At step SB13, the decryption section 223 decrypts the license information 242 to that as shown in Fig. 8D using the key (=def=K2). The DSN (=456) is decrypted here as shown in Fig. 8D. At step SB14, the decryption section 223 transfers the decrypted license information 242 to the AC check section 222.

[0076] At step SB15, the AC check section 222 acquires a DSN (=456) from the MO device 220. At step SB16, the AC check section 222 determines whether

the condition (DSN=456) of the decrypted license information 242 matches the DSN (=456). Assume that the two match. Therefore, the result of determination at step SB16 will be "Yes".

[0077] On the other hand, when the result of determination at step SB16 is "No", the process at step SB26 is performed. At step SB26, the AC check section 222 sends the check result of NG back (no match) to the ACM 213. Accordingly, at step SB27, the ACM 213 sends the check result of NG back to the MPEG2 playback control section 214, and ends the series of processing. Thus, this case indicates that the conditions for the license (MSN=123 & DSN=456) based on the license information 242 are not satisfied, and hence the playback of the contents 241 recorded on the medium 240 is not allowed.

[0078] When the result of determination at step SB16 is "Yes", at step SB17, the AC check section 222 returns the license information 242 shown in Fig. 8E together with the check result of OK (match) obtained at step SB16 to the ACM 213. At step SB18, the ACM 213 transfers the license information 242 to the decryption section 232 of the MPEG2 decoder 230. When receiving the license information 242, at step SB19, the decryption section 232 acquires a key (=ghi=K3) from the MPEG2 decoder 230.

[0079] At step SB20, the decryption section 232 decrypts the license information 242 to that as shown in Fig. 8F using the key (=ghi=K3). The DSN (=789) is decrypted here as shown in Fig. 8F. At step SB21, the decryption section 232 transfers the decrypted license information 242 to the AC check section 231.

[0080] At step SB22, the AC check section 231 acquires a DSN (=789) from the MPEG2 decoder 230. At step SB23, the AC check section 231 determines whether the condition (DSN=789) of the decrypted license information 242 matches the DSN (=789). Assume that the two match. Therefore, the result of determination at step SB23 will be "Yes".

[0081] On the other hand, when the result of determination at step SB23 is "No", the process at step SB26 is performed. At step SB26, the AC check section 231 sends the check result of NG back (no match) to the ACM 213. At step SB27, the ACM 213 sends the check result of NG back to the MPEG2 playback control section 214, and ends the series of processing. Thus, this case indicates that the conditions for the license (MSN=123 & DSN=456 & DSN=789) based on the license information 242 are not satisfied, and hence the playback of the contents 241 recorded on the medium 240 is not allowed.

[0082] When the result of determination at step SB23 is "Yes", at step SB24, the AC check section 231 returns the check result of OK obtained at step SB23 to the ACM 213. At step SB25, the ACM 213 sends all the check results of OK (match) obtained at step SB9, step SB16, and step SB23 back to the MPEG2 playback control section 214, and ends the series of processing. Thus,

this case indicates that all the conditions of the license information 242 recorded on the medium 240 are satisfied, and hence the playback of the recorded contents 241 is authorised.

[0083] The MPEG2 playback control section 214 reads out the contents 241 from the MO disk 240 via the drive 221 and the file system 212, and transfers the contents 241 to the MPEG2 decoder 230. The MPEG2 decoder 230 decodes the contents 241 and plays the video.

[0084] As explained above, in the system of Fig. 5, a plurality of blocks of license information (MSN=123, DSN=456, and so on) are subjected to multiple encryption as shown in Fig. 7 to be recorded on the medium 240. Thus, unauthorized access to the contents 241 can be prevented.

[0085] A case is explained in the above system where the contents 241 is not encrypted. However, the contents 241 may also be encrypted. In this case, a contents decryption key to decrypt the encrypted contents 241 and the license information 242 may be subjected to multiple encryption. This case is explained below as a third content access control system.

[0086] Fig. 10 is a block diagram showing a configuration of the third content access control system. Same legends are assigned in this figure to the sections that are similar to those in Fig. 5. MPEG2 decoder 310 is provided here instead of the MPEG2 decoder 230 shown in Fig. 5. Further, license information 300 is stored on the medium 240 instead of the license information 242 shown in Fig. 5. The contents 241 shown in Fig. 10 is encrypted. These encrypted contents 241 and license information 300 are stored on the medium 240 in a correlated form.

[0087] The MPEG2 decoder 310 decrypts the encrypted contents 241 (for example, video data) using a contents decryption key K_c set by an AC check section 311, and decodes the result of this decryption to play back the contents 241. DSN=789 as device identifying information is allocated to this MPEG2 decoder 310. A decryption section 312 decrypts DSN=789 from the license information 300 using the Key=ghi stored in the MPEG2 decoder 310. The AC check section 311 checks whether the decrypted information satisfies the condition of the license information 300 (in this case, DSN=789).

[0088] Fig. 11 shows an example of a license (license information 300) in the Fig. 10 system. MPEG2 decoder AC: DSN=789 and contents decryption key K_c correspond to the MPEG2 decoder as the target physical element, respectively, and are encrypted by the Key=ghi. This contents decryption key K_c is used for decrypting the encrypted contents in the MPEG2 decoder 310. Further, the DSN=789 and the contents decryption key K_c are license information for the MPEG2 decoder 310.

[0089] MO device AC: DSN=456 corresponds to the MO device as a target physical element. This DSN=456 and these encrypted DSN=789 and contents decryption

key K_c are further subjected to multiple encryption using the Key=def. These DSN=456, DSN=789, and contents decryption key K_c subjected to multiple encryption are the license information for the MO device 220.

[0090] MO media AC: MSN=123 corresponds to the MO disk as a target physical element. This MSN=123, and three of the DSN=456, the DSN=789, and the contents decryption key K_c subjected to multiple encryption are further subjected to multiple encryption using the Key=abc. These MSN=123, DSN=456, DSN=789, and contents decryption key K_c subjected to multiple encryption are the license information for the MO media 240.

[0091] Operation of the Fig. 10 system will be explained below with reference to a flow chart shown in Fig. 13. In this case, it is assumed that the MO disk 240 is set in the drive 221 of the MO device 220. When the user U instructs playback of MPEG2 contents to the MPEG2 playback control section 214 at step SC1 as shown in Fig. 13, at step SC2, the MPEG2 playback control section 214 instructs the playback of the MPEG2 contents to the ACM 213.

[0092] At step SC3, the ACM 213 acquires the encrypted license information 300 shown in Fig. 12A from the MO disk 240 via the file system 212. At step SC4, the ACM 213 transfers the acquired license information 300 to the decryption section 223 of the MO device 220. At step SC5, the decryption section 223 acquires a key (=abc= K_1) from the MO disk 240.

[0093] At step SC6, the decryption section 223 decrypts the license information 300 to that as shown in Fig. 12B using the key (=abc= K_1). The MSN (=123) is decrypted here as shown in Fig. 12B. At step SC7, the decryption section 223 transfers the decrypted license information 300 to the AC check section 222.

[0094] At step SC8, the AC check section 222 acquires an MSN (=123) from the MO disk 240. At step SC9, the AC check section 222 determines whether the condition (MSN=123) of the decrypted license information 300 shown in Fig. 12B matches the MSN (=123). Assume that the two match. Therefore, the result of determination at step SC9 will be "Yes".

[0095] On the other hand, when the result of determination at step SC9 is "No", the process at step SC27 is performed. At step SC27, the AC check section 222 sends the check result of NG (no match) back to the ACM 213. Accordingly, at step SC28, the ACM 213 sends the check result of NG back to the MPEG2 playback control section 214, and ends the series of processing. Thus, this case indicates that the condition for the license (MSN=123) based on the license information 300 is not satisfied, and access to the contents 241 is denied.

[0096] When the result of determination at step SC9 is "Yes", at step SC10 the AC check section 222 returns the license information 300 shown in Fig. 12C together with the check result of OK obtained at step SC9 to the ACM 213. At step SC11, the ACM 213 transfers the received license information 300 to the decryption section

223 of the MO device 220. When receiving the license information 300, at step SC12, the decryption section 223 acquires a key (=def=K2) from the MO device 220. [0097] At step SC13, the decryption section 223 decrypts the license information 300 to that as shown in Fig. 12D using the key (=def=K2). The DSN (=456) is decrypted here as shown in Fig. 12D. At step SC14, the decryption section 223 transfers the decrypted license information 300 to the AC check section 222.

[0098] At step SC15, the AC check section 222 acquires a DSN (=456) from the MO device 220. At step SC16, the AC check section 222 determines whether the condition (DSN=456) of the decrypted license information 300 matches the DSN (=456). Assume that the two match. Therefore, the result of determination at step SC16 will be "Yes".

[0099] On the other hand, when the result of determination at step SC16 is "No", the process at step SC27 is performed. At step SC27, the AC check section 222 sends the check result of NG (no match) back to the ACM 213. Accordingly, at step SC28, the ACM 213 sends the check result of NG back to the MPEG2 playback control section 214, and ends the series of processing. Thus, this case indicates that the conditions for the license (MSN=123 & DSN=456) based on the license information 300 are not satisfied, thus the playback of the contents 241 recorded on the medium 240 is not allowed.

[0100] When the result of determination at step SC16 is "Yes", at step SC17 the AC check section 222 returns the license information 300 shown in Fig. 12E together with the check result of OK obtained at step SC16 to the ACM 213. At step SC18, the ACM 213 transfers the received license information 300 to the decryption section 312 of the MPEG2 decoder 310. When receiving the license information 300, at step SC19, the decryption section 312 acquires a key (=ghi=K3) from the MPEG2 decoder 310.

[0101] At step SC20, the decryption section 312 decrypts the license information 300 to that as shown in Fig. 12F using the key (=ghi=K3). The DSN (=789) is decrypted here as shown in Fig. 12F. At step SC21, the decryption section 312 transfers the decrypted license information 300 to the AC check section 311.

[0102] Accordingly, at step SC22, the AC check section 311 acquires a DSN (=789) from the MPEG2 decoder 310. At step SC23, the AC check section 311 determines whether the condition (DSN=789) of the decrypted license information 300 matches the DSN (=789). Assume that the two match. Therefore, the result of determination at step SC23 will be "Yes".

[0103] On the other hand, when the result of determination at step SC23 is "No", the process at step SC27 is performed. At step SC27, the AC check section 311 sends the check result of NG (no match) back to the ACM 213. At step SC28, the ACM 213 sends the check result of NG back to the MPEG2 playback control section 214, and ends the series of processing. Thus, this

case indicates that the conditions for the license (MSN=123 & DSN=456 & DSN=789) based on the license information 300 are not satisfied, and access to the information recorded on the disk 240 is not allowed.

[0104] When the result of determination at step SC23 is "Yes", at step SC24, the AC check section 311 sets a contents decryption key K_c in the MPEG2 decoder 310. At step SC25, the AC check section 311 sends the check result of OK (match) obtained at step SC23 back to the ACM 213. At step SC26, the ACM 213 sends all the check results of OK obtained at step SC9, step SC16, and step SC23 back to the MPEG2 playback control section 214, and ends the series of processing. Thus, this case indicates that all the conditions of the license information 300 recorded on the medium 240 are satisfied, and hence the playback of the disk 240 is allowed.

[0105] The MPEG2 playback control section 214 reads out the encrypted contents 241 from the MO media 240 via the drive 221 and the file system 212, and transfers the contents 241 to the MPEG2 decoder 310. Thus, the MPEG2 decoder 310 decrypts the contents 241 using the contents decryption key K_c set at step SC24 decodes and plays the moving pictures.

[0106] As explained above, in the system of Fig. 10, in addition to the plurality of blocked license information (MSN=123, DSN=456, and so on), the contents decryption key K_c to decrypt the contents 241 is subjected to multiple encryption as shown in Fig. 11 to be recorded on the medium 240. Thus, unauthorized access to the contents 241 can more effectively be prevented.

[0107] A case is explained in the Fig. 10 system where the file system 212 shown in Fig. 10 unconditionally reads out license information from the MO media 240. However, for the purpose of achieving higher security, the system may be configured so that encrypted license information is stored on a secured region (encrypted region) of the medium 240 and only the file system, that can decrypt this encrypted license information, can read out the license information. This case is explained below as a fourth content access control system.

[0108] Fig. 14 is a block diagram showing a configuration of the content access control system. Same legends are assigned in this figure to the sections that are similar to those in Fig. 10. As shown in Fig. 14, medium 440 and computer 400 are provided instead of the medium 240 and the computer 210 shown in Fig 10.

[0109] The medium 440 shown in Fig. 14 has a non-secured region A_1 where encrypted contents 441 is stored and a secured region A_2 where encrypted license information 442 is stored as shown in detail in Fig. 15. The non-secured region A_1 is a user region to which access can be made using any ordinary file system. Whereas, the secured region A_2 is a region to which access can not be made by the ordinary file system, namely, to which only a file system 410 having a decryption unit 411 shown in Fig. 14 can get access.

[0110] The license information 442 shown in Fig. 15 is obtained by encrypting the license information 300

(see Fig. 10 and Fig. 11). Therefore, the MSN=123, the DSN=456, the DSN=789, and the contents decryption key K_c shown in Fig. 11 are included in the license information 442. Further, the license information 442 is managed by auxiliary file management data D_{C2} as shown in Fig. 15.

[0111] On the other hand, file management data D_{C1} in the non-secured region A_1 is data for managing the contents 441 and also for managing indirectly the license information 442 via auxiliary file management data D_{C2} . Thus, the contents 441 and the license information 442 are correlated with each other via the file management data D_{C1} and the auxiliary file management data D_{C2} on the medium 440. Referring to Fig. 14, the file system 410 of the computer 400 reads out the license information 442, the contents 441, the Key=abc, and MSN=123 from the MO disk 440, respectively. The decryption unit 411 decrypts the encrypted license information 442.

[0112] Operation of the Fig. 14 system will be explained below with reference to flow charts shown in Fig. 16 and Fig. 17. It is assumed here that an MO disk 440 is set in the drive 221 of the MO device 220. When the user U instructs playback of MPEG2 contents to the MPEG2 playback control section 214 at step SD1 as shown in Fig. 16, at step SD2, the MPEG2 playback control section 214 instructs retrieval of the MPEG2 data to the ACM 213.

[0113] At step SD3, the file system 410 accesses the secured region A_2 of the medium 440 to acquire the encrypted license information 442, and then transfers the information to the decryption unit 411. At step SD4, the decryption unit 411 decrypts the encrypted license information 442 using a specified key. At step SD5, the decryption unit 411 transfers the decrypted license information 442 to the ACM 213.

[0114] At step SD6 shown in Fig. 17, the ACM 213 transfers the decrypted license information 442 to the decryption section 223 of the MO device 220. At step SD7, the decryption section 223 acquires a key (=abc=K1 (see Fig. 12A) from the MO media 440, and proceeds to step SD8. At step SD8, the decryption section 223 decrypts the license information 442 to that as shown in Fig. 12B using the key (=abc). The MSN (=123) is decrypted here as shown in Fig. 12B. At step SD9, the decryption section 223 transfers the decrypted license information 442 to the AC check section 222.

[0115] At step SD10, the AC check section 222 acquires an MSN (=123) from the MO disk 440. At step SD11, the AC check section 222 determines whether the condition (MSN=123) of the decrypted license information 442 shown in Fig. 12B matches the MSN (=123). Assume that the two match. Therefore, the result of determination at step SD11 will be "Yes".

[0116] On the other hand, when the result of determination at step SD11 is "No", the process at step SD29 is performed. At step SD29, the AC check section 222 sends the check result of NG (no match) back to the

ACM 213. Accordingly, at step SD30, the ACM 213 sends the check result of NG back to the MPEG2 playback control section 214, and ends the series of processing. Thus, this case indicates that the condition for the license (MSN=123) based on the license information 442 is not satisfied, and hence access to the data 441 on the disk is prohibited.

[0117] When the result of determination at step SD11 is "Yes", at step SD12, the AC check section 222 returns the license information 442 (see Fig. 12C) together with the check result of OK obtained at step SD11 to the ACM 213. Accordingly, at step SD13, the ACM 213 transfers the received license information 442 to the decryption section 223 of the MO device 220. When receiving the license information 442, at step SD14, the decryption section 223 acquires a key (=def=K2) from the MO device 220.

[0118] At step SD15, the decryption section 223 decrypts the license information 442 to that as shown in Fig. 12D using the key (=def=K2). The DSN (=456) is decrypted here as shown in Fig. 12D. At step SD16, the decryption section 223 transfers the decrypted license information 442 to the AC check section 222.

[0119] At step SD17, the AC check section 222 acquires a DSN (=456) from the MO device 220. At step SD18, the AC check section 222 determines whether the condition (DSN=456) of the decrypted license information 442 matches the DSN (=456). Assume that the two match. Therefore, the result of determination at step SD18 will be "Yes".

[0120] On the other hand, when the result of determination at step SD18 is "No", the process at step SD29 is performed. At step SD29, the AC check section 222 sends the check result of NG (no match) back to the ACM 213. Accordingly, at step SD30, the ACM 213 sends the check result of NG back to the MPEG2 playback control section 214, and ends the series of processing. Thus, this case indicates that the conditions for the license (MSN=123 & DSN=456) based on the license information 442 are not satisfied, and hence playback is prohibited.

[0121] When the result of determination at step SD18 is "Yes", at step SD19, the AC check section 222 returns the license information 442 shown in Fig. 12E together with the check result of OK obtained at step SD18 to the ACM 213. At step SD20, the ACM 213 transfers the received license information 442 to the decryption section 312 of the MPEG2 decoder 310. When receiving the license information 442, at step SD21, the decryption section 312 acquires a key (=ghi=K3) from the MPEG2 decoder 310.

[0122] At step SD22, the decryption section 312 decrypts the license information 442 to that as shown in Fig. 12F using the key (=ghi=K3). The DSN (=789) is decrypted here as shown in Fig. 12F. At step SD23, the decryption section 312 transfers the decrypted license information 442 to the AC check section 311.

[0123] At step SD24, the AC check section 311 ac-

quires a DSN (=789) from the MPEG2 decoder 310. At step SD25, the AC check section 311 determines whether the condition (DSN=789) of the decrypted license information 442 matches the DSN (=789). Assume that the two match. Therefore, the result of determination at step SD25 will be "Yes".

[0124] On the other hand, when the result of determination at step SD25 is "No", the process at step SD29 is performed. At step SD29, the AC check section 311 sends the check result of NG (no match) back to the ACM 213. Accordingly, at step SD30, the ACM 213 sends the check result of NG back to the MPEG2 playback control section 214, and ends the series of processing. Thus, this case indicates that the conditions for the license (MSN=123 & DSN=456 & DSN=789) based on the license information 442 are not satisfied, and reading is prohibited.

[0125] When the result of determination at step SD25 is "Yes", at step SD26 the AC check section 311 sets a contents decryption key K_c in the MPEG2 decoder 310. At step SD27, the AC check section 311 sends the check result of OK (match) obtained at step SD25 back to the ACM 213. Accordingly, at step SD28, the ACM 213 sends all the check results of OK obtained at step SD11, step SD18, and step SD25 back to the MPEG2 playback control section 214, and ends the series of processing. Thus, this case indicates that all the conditions of the license information 442 recorded on the medium 440 are satisfied, and hence the output of data from the medium is permitted.

[0126] The MPEG2 playback control section 214 reads out the encrypted contents 441 from the medium 440 via the drive 221 and the file system 410, and transfers the read-out contents 441 to the MPEG2 decoder 310. Thus, the contents 441 decrypted by the contents decryption key K_c set at step SD26 are decoded to the moving pictures in the MPEG2 decoder 310.

[0127] A data write device that writes the license information 442 shown in Fig. 14 on the medium 440 where the contents 441, the Key=abc, and the MSN=123 have already been stored is explained below with reference to Fig. 18. The license information 442 is not stored on the medium 440. A computer 460 in Fig. 18 is a device which is installed in a station (for example, railway station or bus station) or in a convenience store, or some similar places, and through which license information is purchased. A license-information purchase application program 461 for purchasing license information is started up in this computer 460. OS 462 controls the license-information purchase application program 461.

[0128] A file system 463 manages files handled in the computer 460 and controls read/write of data. An encryption unit 464 encrypts data to be written onto an MO disk 440. A license server 450 is placed in the side of contents provider, and it is connected to the computer 460 via a network N. This license server 450 sells the license information. MO device 470 is provided to the

computer 460 externally (or internally), and writes data onto MO media (MO disks 440 in Fig. 18). This MO device 470 has a drive 471 to drive the MO media.

[0129] Operation of the data write unit shown in Fig. 18 will be explained below with reference to Fig. 19. At step SE1 shown in Fig. 19, the user U instructs to purchase license information 442 by entering parameters such as a file name (e.g., title of the song) and a server name using a not shown input device. Accordingly, at step SE2, the license-information purchase application program 461 purchases (acquires) the license information 442 from the license server 450 via the network N.

[0130] At step SE3, the license-information purchase application program 461 transfers the license information 442 to the file system 463. At step SE4, the encryption unit 464 of the file system 463 encrypts the license information 442 using a predetermined key. At step SE5, the file system 463 stores the encrypted license information 442 on the secured region A_2 (see Fig. 15) of the MO disk 440 through the MO device 470.

[0131] As explained above, according to the Fig. 14 system, the encrypted license information 442 is recorded on the secured region A_2 of the medium 440 as shown in Fig. 15. Therefore, unauthorized access to the contents 441 can be prevented.

[0132] Fig. 20 is a block diagram showing a configuration of a fifth content access control system. Same legends are assigned in this figure to the sections that are similar to those in Fig. 10. A disk 540, computer 500, and MO device 520 are provided instead of the MO disk 240, the computer 210, and the MO device 220 shown in Fig. 10.

[0133] The medium 540 shown in Fig. 20 has an ordinary region B_1 , a specific region B_2 , and a media management region B_3 as shown in detail in Fig. 21. The ordinary region B_1 stores data (contents) 541 and this ordinary region B_1 extends from PSN (Physical Sector Number)=M+1 to PSN=N. The specific region B_2 is where access can be made only when a mutual authentication command (specific command) explained later is issued and the license information 542 shown in Fig. 20 is stored. This license information 542 has the same data structure as that of license information 300. This specific region B_2 extends from PSN=L to PSN=M.

[0134] The media management region B_3 is where a media management table T, that defines ranges of the ordinary region B_1 and the specific region B_2 on the medium 540, is stored. Start PSNs (header number of each of the physical sector numbers) of the ordinary region B_1 and the specific region B_2 are defined in this media management table T. Further, end PSNs (end number of each of the physical sector numbers) of the ordinary region B_1 and the specific region B_2 are also defined in the table T. This media management region B_3 extends from PSN=1 to PSN=L.

[0135] Referring to Fig. 20, Key=abc and MSN=123, in addition to the contents 541 and the license information 542, are stored on the medium 540 in the same

manner as that of the medium 240 (see Fig. 10). A file system 510 in the computer 500 manages files handled by the computer 500 and controls read/write of data. A mutual authentication module 511 holds secret information (henceforth, computer-side secret information) common to secret information (henceforth, MO device-side secret information) held by a mutual authentication module 521 of the MO device 520.

[0136] The mutual authentication module 511 performs mutual authentication with the mutual authentication module 521 when the mutual authentication command is issued. That is, the mutual authentication module 511 transmits computer-side secret information to the mutual authentication module 521, and performs mutual authentication depending on whether the MO device-side secret information from the mutual authentication module 521 matches the computer-side secret information held by the module 511. The file system 510 can read out the license information 542 from the specific region B_2 of the medium 540 only when these two modules are mutually authenticated.

[0137] Referring to the MO device 520, the mutual authentication module 521 holds, as explained above, the MO device-side secret information common to the computer-side secret information held by the mutual authentication module 511 of the file system 510. When receiving the computer-side secret information from the mutual authentication module 511, the mutual authentication module 521 transmits the MO device-side secret information held by the module 521 to the mutual authentication module 511. Further, the mutual authentication module 521 performs mutual authentication depending on whether the computer-side secret information from the mutual authentication module 511 matches the MO device-side secret information held by the module 521.

[0138] Operation of the above system will be explained below with reference to flow charts shown in Fig. 22 and Fig. 13. It is assumed here that the medium 540 is set in the drive 221 of the MO device 520 shown in Fig. 20. When the user U instructs playback of MPEG2 contents to the MPEG2 playback control section 214 at step SF1 shown in Fig. 22, at the next step SF2 the MPEG2 playback control section 214 instructs the playback of the MPEG2 contents to the ACM 213.

[0139] At step SF3, a mutual authentication command is issued from the ACM 213 to the file system 510, and mutual authentication is performed between the mutual authentication module 511 and the mutual authentication module 521. In other words, the mutual authentication module 511 of the file system 510 transmits the computer-side secret information to the mutual authentication module 521 of the MO device 520. When this computer-side secret information is received, the mutual authentication module 521 transmits the MO device-side secret information to the mutual authentication module 511.

[0140] The mutual authentication module 521 then determines whether the received computer-side secret

information matches the MO device-side secret information held by the module 521, and transfers the result of the determination to the mutual authentication module 511. On the other hand, when receiving the MO device-side secret information from the mutual authentication module 521, the mutual authentication module 511 then determines whether the received MO device-side secret information matches the computer-side secret information held by the module 511.

[0141] At step SF4, the file system 510 determines whether mutual authentication has been obtained based on both of the result of determination on the mutual authentication in the mutual authentication module 511 and the result of determination on the mutual authentication in the mutual authentication module 521. When respective results of the determination indicate "match", the file system 510 transfers the result of mutual authentication of OK to the ACM 213, and determines that the result of determination at step SF4 is "Yes".

[0142] Accordingly, at step SC3 shown in Fig. 13, the ACM 213 acquires the license information 542 from the specific region B_2 of the medium 540 via the file system 510. From then on, the processing from step SC4 to step SC28 is executed in the same manner as that of the Fig. 10 system. It is assumed in the Fig. 20 system that the MO disk 540, the license information 542, the contents 541, the file system 510, and the MO device 520 are substituted for the MO_{disk} 240, the license information 300, the contents 241, the file system 212, and the MO device 220, respectively.

[0143] On the other hand, at step SF4 shown in Fig. 22, when both of the result of the determination on mutual authentication in the mutual authentication module 511 and the result of the determination on mutual authentication in the mutual authentication module 521 indicate "no match", the file system 510 determines that the result of determination is "No", and proceeds to step SC27 shown in Fig. 13. At step SC27, the file system 510 transfers the mutual authentication result of NG (no match) to the ACM 213. In this case, mutual authentication is not obtained, therefore, there is no possibility that the license information 542 is read out from the specific region B_2 of the medium 540 shown in Fig. 20.

[0144] A formatting device that sets an ordinary region B_1 and a specific region B_2 of the medium 540 shown in Fig. 20 is explained below with reference to Fig. 23. Computer 560 shown in this figure physically formats the medium 540. A formatter 561 provides controls for a physical format of the medium 540. OS 562 controls various types of application programs. A device driver 563 drives an MO device 570. The MO device 570 is provided to the computer 560 externally (or internally). This MO device 570 has a drive 571 that drives MO disks and performs physical formatting.

[0145] Operation of the formatting device shown in Fig. 23 will be explained below with reference to Fig. 24. At step SG1, the user U instructs formatting of the me-

dium 540 by specifying the size of the secured region (specific region B₂) using a not shown input device. Accordingly, at step SG2, the formatter 561 instructs physical formatting to a physical formatting section 572 via the device driver 563. At step SG3, the physical formatting section 572 then executes physical formatting of the MO disk 540. Thus, an ordinary region B₁ and a specific region B₂ are formed.

[0146] As explained above, according to the system of Fig. 20, the license information 542 is recorded on the specific region B₂ of the MO disk 540 shown in Fig. 21. The license information 542 is then acquired from the specific region B₂ only when respective mutual authentication is obtained in both of the mutual authentication module 511 and the mutual authentication module 521. Therefore, the license can be disapproved at the instant at which it is determined that mutual authentication is not obtained. Thus, unauthorized access to the contents 541 can be prevented.

[0147] A case is explained in the Fig. 14 system where the medium 440 has the non-secured region A₁ and the secured region A₂ as shown in Fig. 15. Further, a case is explained in the Fig. 20 system where the medium 540 has the ordinary region B₁ and the specific region B₂ as shown in Fig. 21. A combination of the Fig. 14 system (non-secured region A₁ and secured region A₂) with the Fig. 20 system (ordinary region B₁ and specific region B₂) is explained below.

[0148] A disk 600 shown in Fig. 25 is used in this system. It has the ordinary region B₁ (see Fig. 21) and the non-secured region A₁ (see Fig. 15) mapped with each other, and also has the specific region B₂ (see Fig. 21) and the secured region A₂ (see Fig. 15) mapped with each other. Further, the ordinary region B₁ (corresponding to the non-secured region A₁) stores the contents 441 and the file management data D_{C1} that manages the contents. Whereas, the specific region B₂ (corresponding to the secured region A₂) stores the license information 442 and the file management data D_{C2} that manages the license information.

[0149] As explained above, in the system of Fig. 25, the secured region A₂ is mapped to the specific region B₂, both of which are effective in security. Thus, extremely high security can be ensured.

[0150] The contents and the license information (AC) stored on a medium in the above systems may be transferred to another medium. This is the subject of the present invention. Fig. 26 is a block diagram showing a configuration of a packed data generating device according to an embodiment of this invention. Fig. 27 is a block diagram showing a configuration of an unpacking device according to the embodiment of this invention.

[0151] These packed data generating device (see Fig. 26) and unpacking device (see Fig. 27) are connected to each other via a not shown cable or a network. The packed data generating device shown in Fig. 26 transfers license information 801 and encrypted contents 802, that are stored on a disk 800, as a grouping

of data (packed data 830) to the unpacking device (see Fig. 27).

[0152] The license information 801 stored on the disk 800 is the license information (AC) according any of the above systems. This license information 801 includes MSN and keys. The encrypted content 802 is content that is encrypted. A computer 820 is installed in the transmission side. OS 821 controls execution of various types of application programs. A file system 822 manages files handled by the computer 820 and controls read/write of data.

[0153] A packing section 823 generates a file (packed data 830) from the license information 801 and the encrypted contents 802. A transfer section 824 transfers the packed data 830 to the unpacking device (see Fig. 27). MO device 810 is provided to the computer 820 externally (or internally), and reads out the license information 801 and the encrypted contents 802 from the disk (medium 800 in Fig. 26). This MO device 810 has a drive 811.

[0154] On the other hand, in Fig. 27, computer 920 is installed in the reception side. OS 921 controls execution of various types of application programs. A file system 922 manages files handled by the computer 920 and controls read/write of data. A reception section 924 receives the packed data 830 transferred from the packed data generating device (see Fig. 26). An unpacking section 923 generates two files (license information 801 and encrypted contents 802) from the packed data 830. MO device 910 is installed to the computer 920 externally (or internally), and writes the license information 801 and the encrypted contents 802 onto a disk (medium 900 in Fig. 27) via a drive 911.

[0155] Based on this configuration, when the license information 801 and the encrypted contents 802 are read out from the medium 800 shown in Fig. 26, the packing section 823 generates a file (packed data 830) from these license information 801 and encrypted contents 802 and transfers the file to the transfer section 824. Accordingly, the transfer section 824 transfers the packed data 830 to the unpacking device shown in Fig. 27 via the cable or the network.

[0156] When the packed data 830 is received by the reception section 924 shown in Fig. 27, the unpacking section 923 generates the license information 801 and the encrypted contents 802 from the packed data 830. Thus, the license information 801 and the encrypted contents 802 are written onto the MO disk 900. In the present invention, the license information 801 and the encrypted contents 802 can be transferred (copied) from one disk 800 to another 900 in the manner as explained above. Thus, the license regarding the playback of contents can easily be transferred.

[0157] As explained above, according to the present invention, the encrypted contents 802 and the license information 801 are transferred (copied) between media. Thus, the license allowing replay of the contents 801 can be transferred to a third party.

[0158] For example, in the present invention, access to contents may be controlled by recording a contents access control program, that realizes functions of the access control system, on a computer-readable recording medium, and making the computer read and execute the contents access control program recorded on the recording medium. The recording medium includes not only any transportable type of recording medium such as an optical disk, a floppy disk, or a hard disk, but also any transport media such as a network that temporarily records and holds data.

[0159] As explained above, in a control access control system, license information and contents are correlated with each other and recorded on one medium, and access to the contents is controlled based on the license information and the identifying information. Therefore, by acquiring the medium, both of the license information and the contents can concurrently be obtained. Resultantly, the system has such an advantageous effect that the contents can more easily be utilized as compared to the conventional case where the license information and the contents are separately acquired.

[0160] Further, a plurality of blocks of license information are subjected to multiple encryption and recorded on the medium. Resultantly, the invention has such an advantageous effect that unauthorized access to contents can be prevented.

[0161] Further, in addition to the plural blocks of license information, the contents decryption key to decrypt the contents may be multiply-encrypted and recorded on a medium.

[0162] Resultantly, the system has such an advantageous effect that unauthorized access to contents can more effectively be prevented.

[0163] Further, encrypted license information can be recorded on the secured region of a medium. This measure has such an advantageous effect that unauthorized access to contents can be prevented.

[0164] Further, license information can be recorded on the secured region such that only when two physical elements are mutually authenticated, the license information is acquired from the specific region. Therefore, the license can be disapproved at the instant at which it is determined that mutual authentication is not obtained. There is thus provided an advantageous effect that unauthorized access to contents can be prevented.

[0165] Further, the secured region may be mapped to the specific region, both of which are effective in security. Resultantly, there is provided an advantageous effect that extremely high security can be ensured.

[0166] Further, the contents and the license information can be transferred (copied) from one medium to another.

Resultantly, the invention has such an advantageous effect that the license regarding access to contents can be transferred to a third party.

[0167] Although the invention has been described with respect to a specific embodiment for a complete

and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art which fairly fall within the basic teaching herein set forth.

Claims

1. A content access control system comprising:

a read unit (810) which reads out content (802) and license information (801) from a medium (800) where the content to be provided from an authenticated information provider to a user and the license information regarding access to the content are recorded in correlation with each other;

a transfer unit (824) which transfers the read-out content and license information;

a reception unit (924) which receives the read-out content and license information; and

a write unit (910) which generates the content and the license information from the read-out content and license information received by the reception unit, and writes the generated content and license information onto another medium (900); **characterized in that:**

the transfer unit (824) transfers the read-out content (802) and license information (801) as a file;

the reception unit (924) receives the file;

the write unit (910) generates the contents and the license information from the file, items of identifying information being allocated to two or more of the read unit (810), transfer unit (824), reception unit (924) and write unit (910), respectively;

the license information (242) recorded in the medium (240) includes two or more blocks of license information each of which includes a respective item of said identifying information;

the blocks of license information are subjected to multiple encryption by setting a logical product of the identifying information included in the blocks of license information; and

the system allows access to the content (802) only when the decrypted license information satisfies the logical product.

2. A content access control method comprising the steps of:

reading out content (241, 441, 541) and license information (242, 300, 442, 542) from a medium

(240, 440, 540) where the content to be provided from an authenticated information provider to a user and the license information regarding access to the content are recorded in correlation with each other;
transferring the read-out content (241, 441, 541) and license information (242, 300, 442, 542);
receiving the read-out content and license information; and
generating the received content (241, 441, 541) and the license information (242, 300, 442, 542), and writing the generated content and license information onto another medium (900);

characterized in that the method further comprises the steps of:

transferring the read-out content (241, 441, 541) and license information (242, 442, 542) as a file;
allocating respective items of identifying information to physical elements (220, 230, 240) included in a utilization unit for carrying out said method;
setting the license information recorded in the medium (240, 440, 540) so as to include two or more blocks of license information allocated to said physical elements (220, 230, 240) respectively, wherein the blocks of license information include respective items of said identifying information allocated to the physical elements (220, 230, 240);
performing multiple encryption for the license information by setting a logical product of the identifying information included in the blocks of license information; and
allowing access to the content (241, 441, 541) only when the decrypted license information satisfies the logical product.

3. A computer program comprising computer program code means which when run on a general-purpose computer, carries out the method of claim 2.
4. A computer-readable recording medium on which is recorded the computer program of claim 3.

FIG. 1

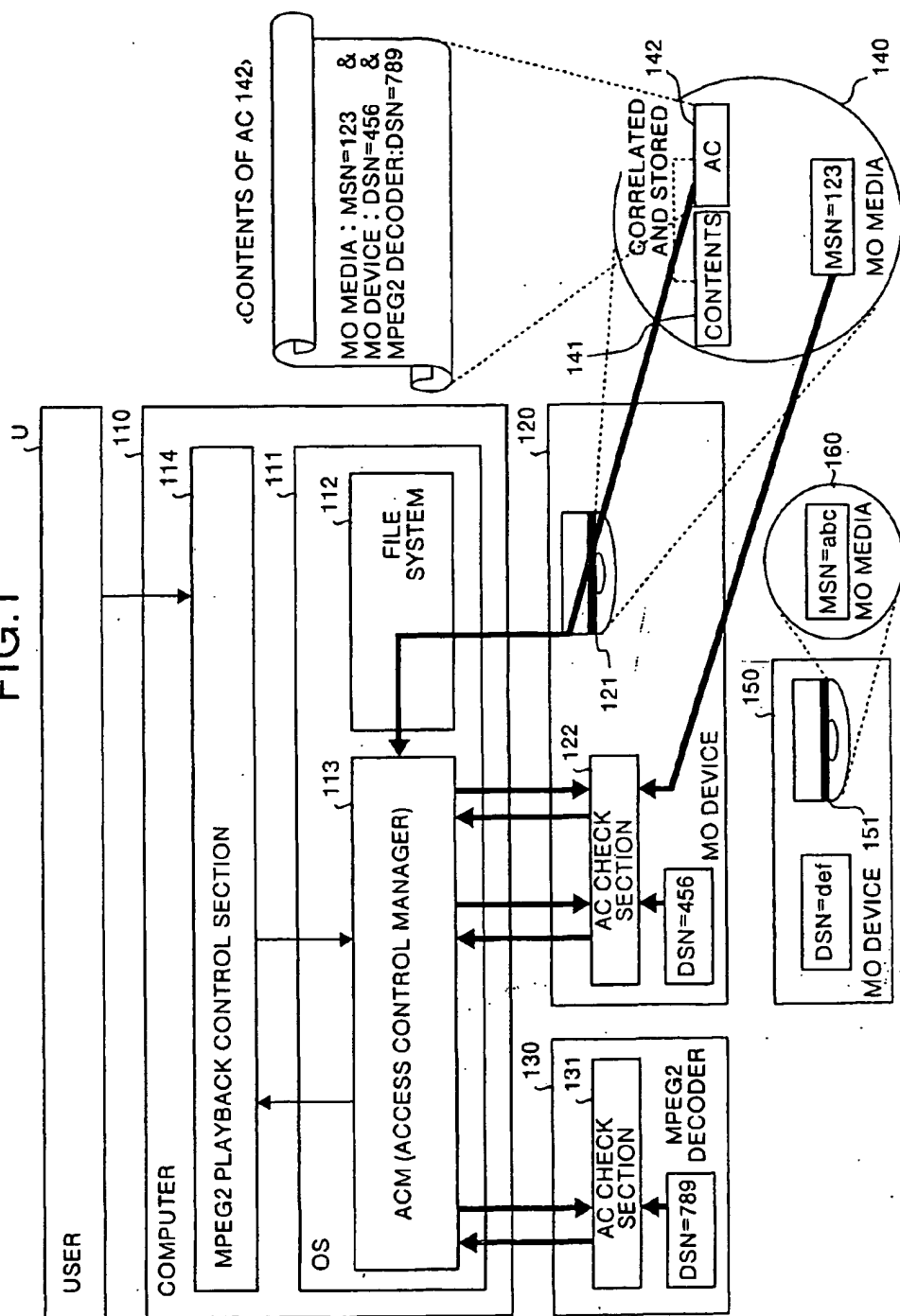


FIG.2

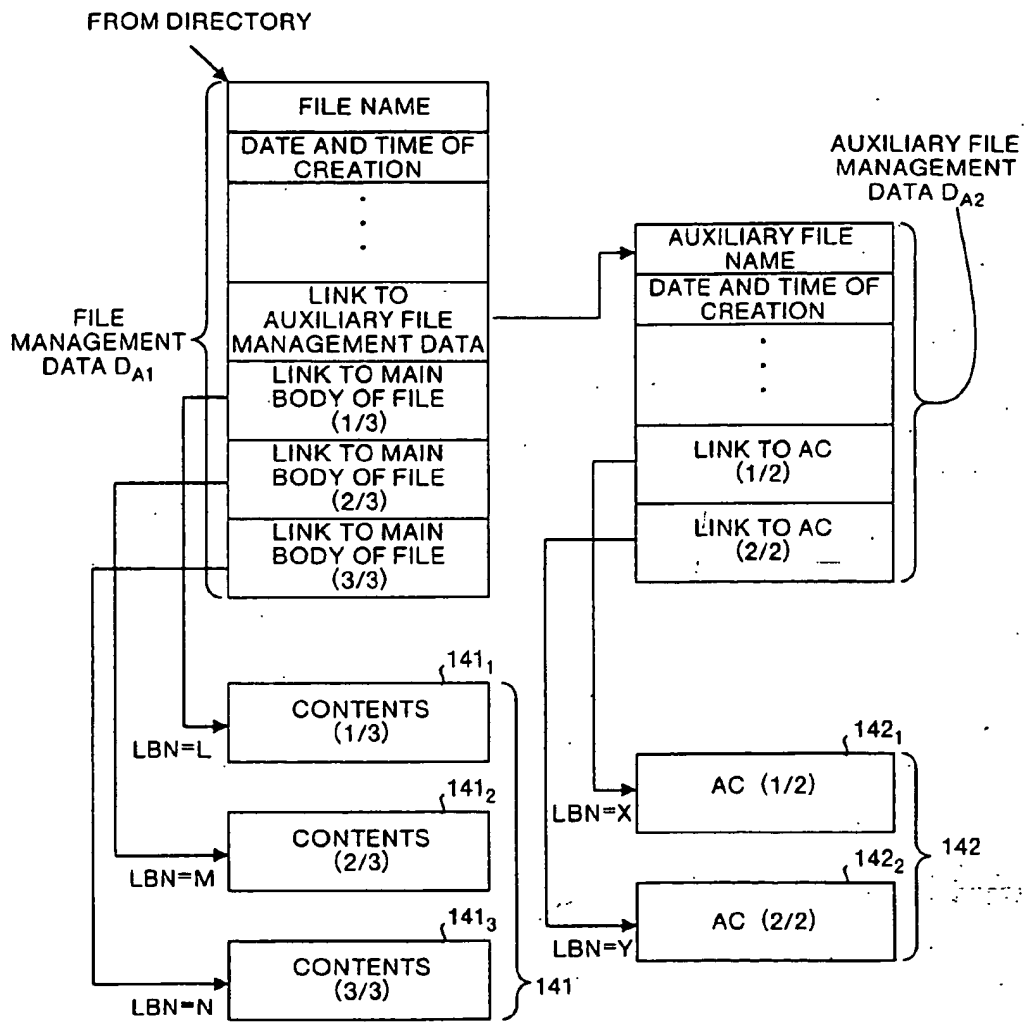


FIG.3

142

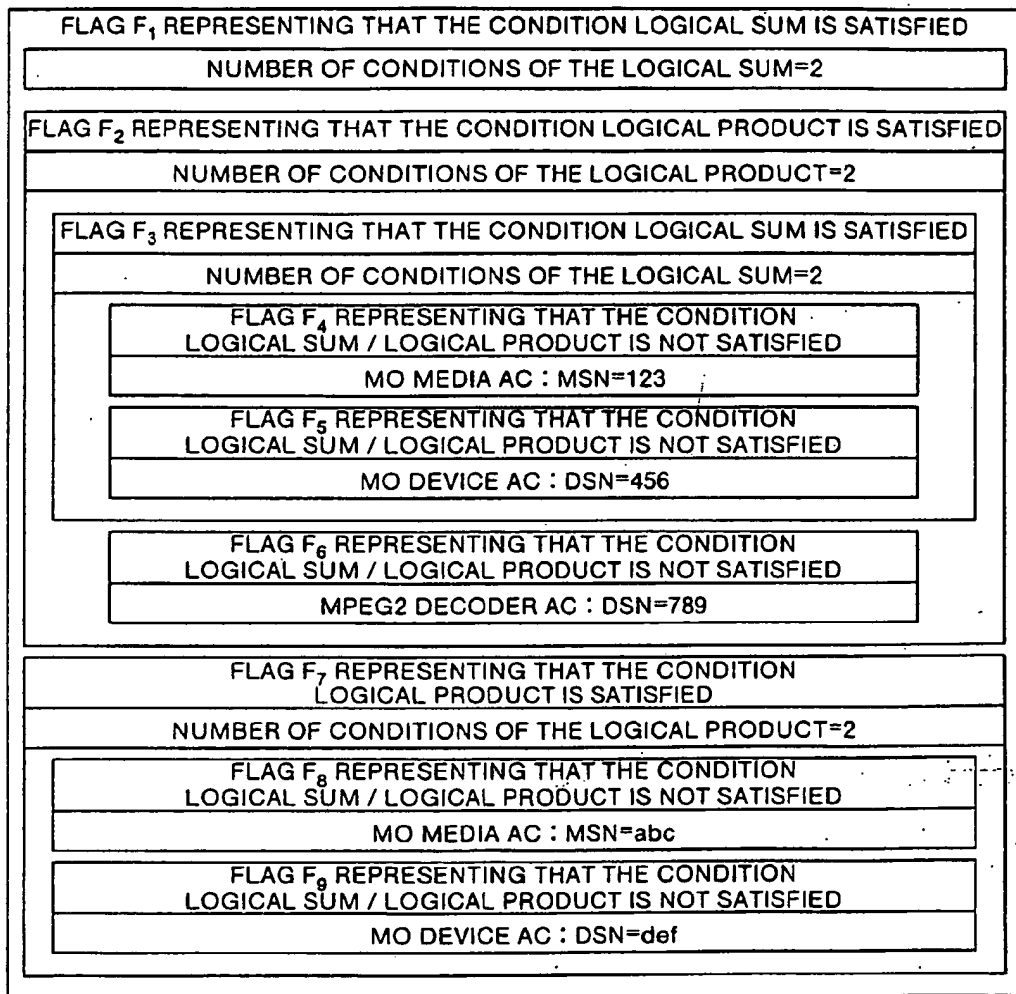


FIG.4

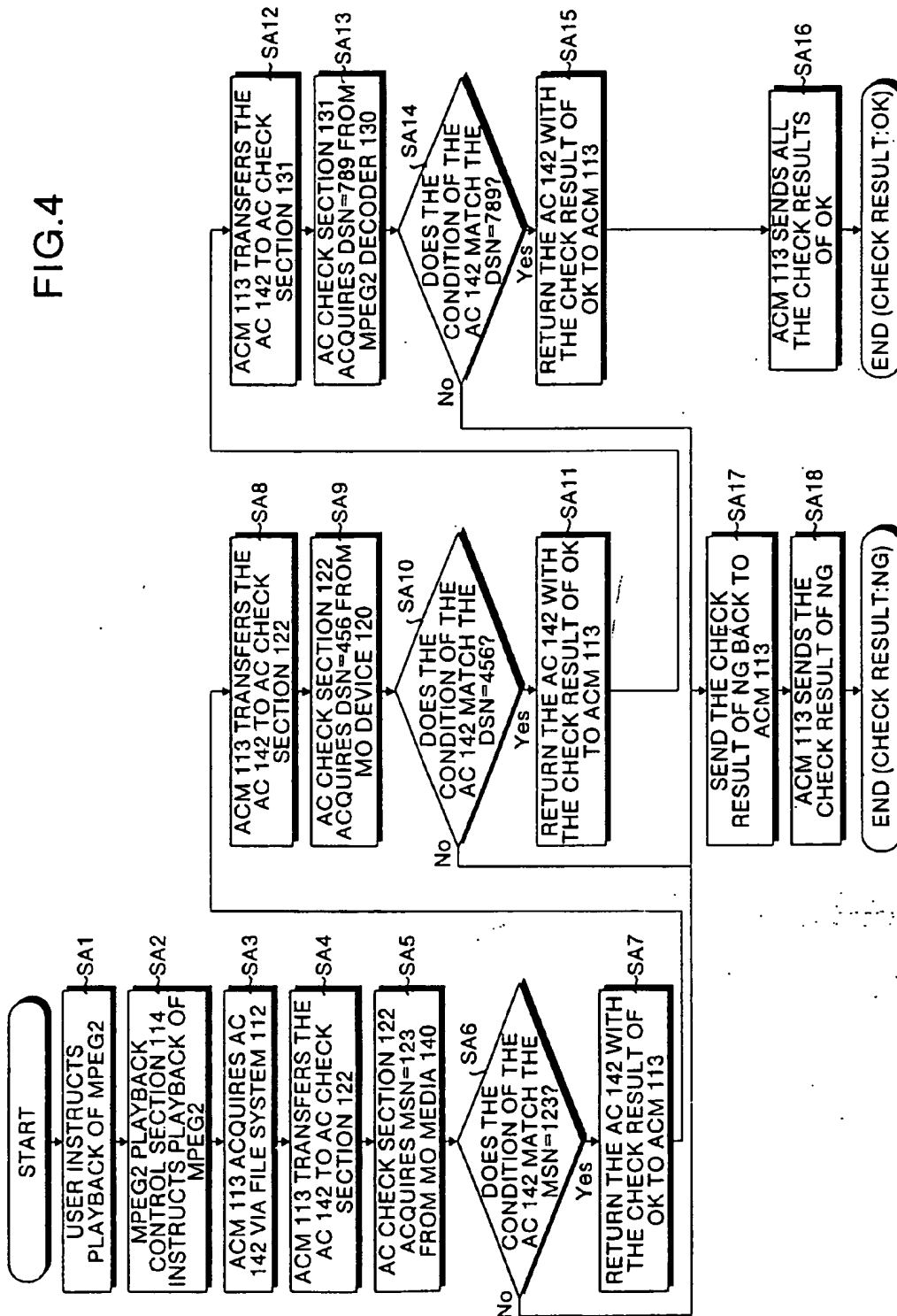


FIG.5

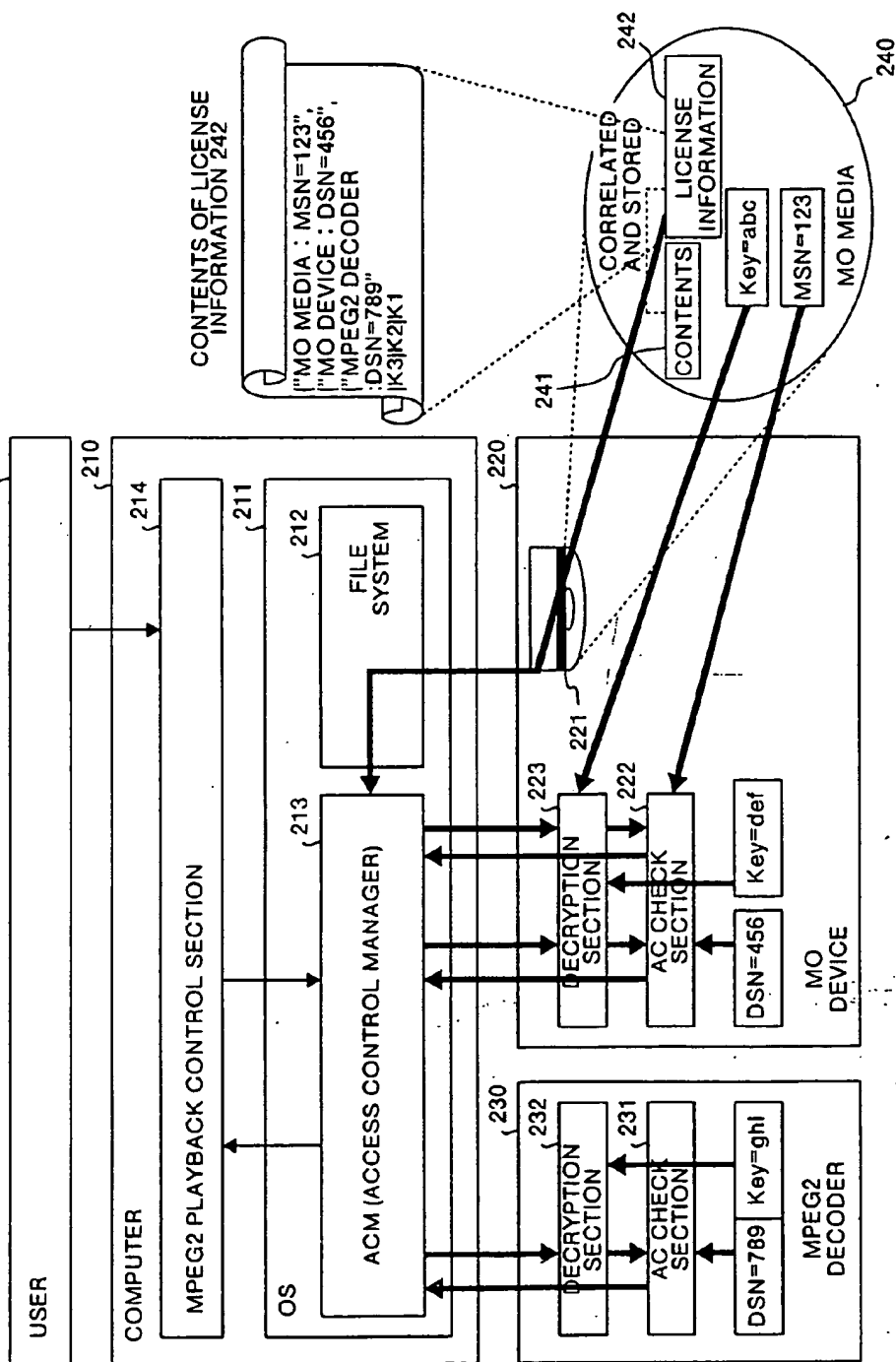


FIG.6

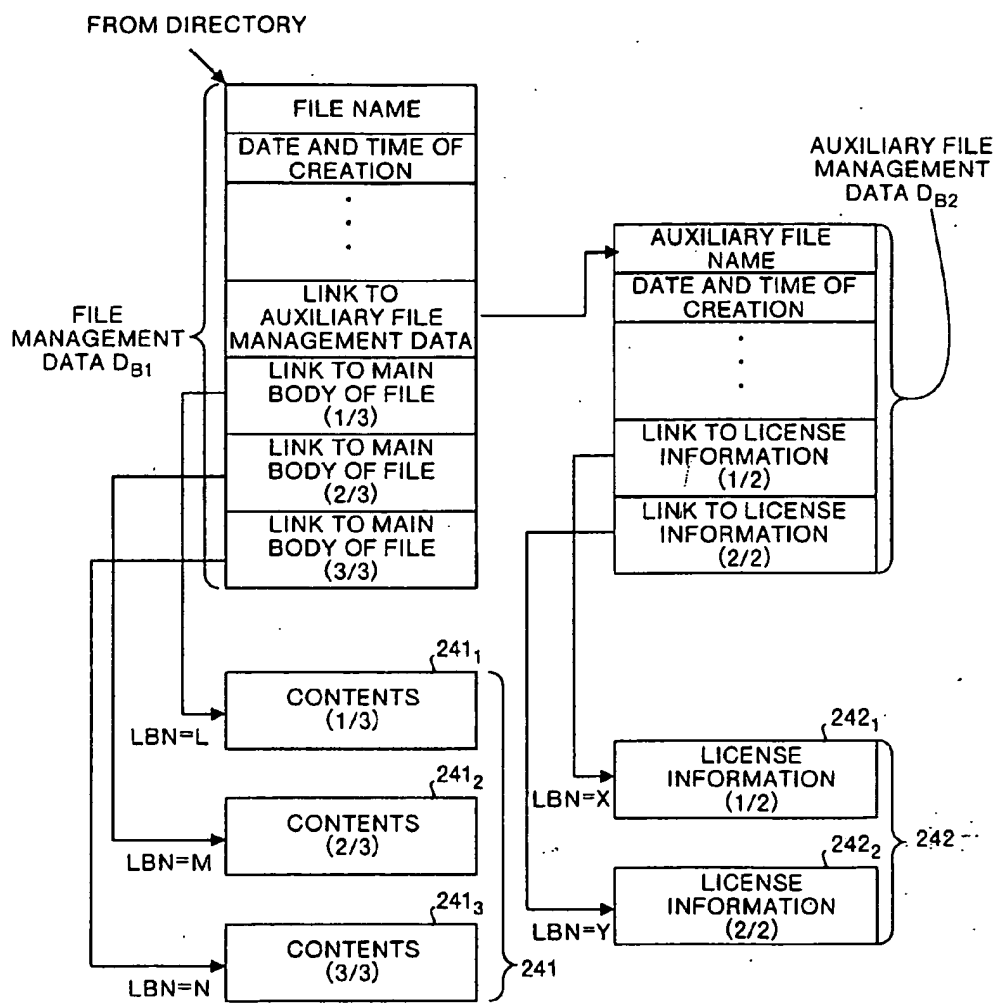


FIG.7

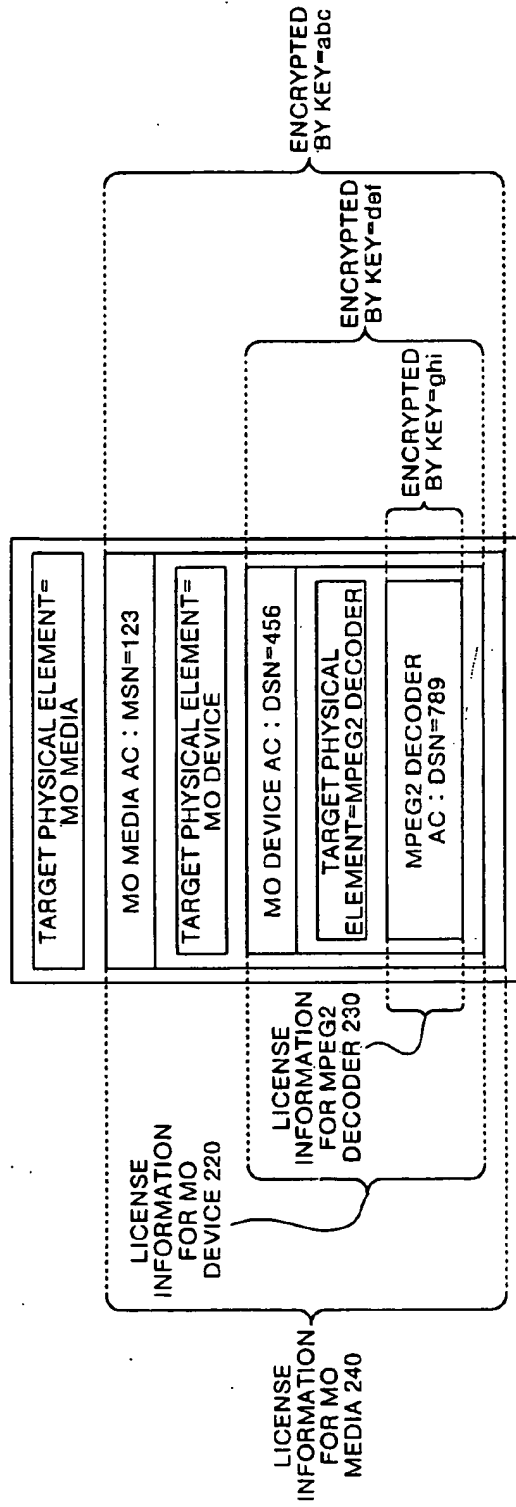


FIG.8A

{ "MO MEDIA : MSN=123" , | "MO DEVICE : DSN=456" , | "MPEG2 DECODER : DSN=789" } K3| K2| K1

FIG.8B

"MO MEDIA : MSN=123" , { "MO DEVICE : DSN=456" , | "MPEG2 DECODER : DSN=789" } K3| K2

FIG.8C

{ "MO DEVICE : DSN=456" , | "MPEG2 DECODER : DSN=789" } K3| K2

FIG.8D

"MO DEVICE : DSN=456" , { "MPEG2 DECODER : DSN=789" } K3

FIG.8E

{ "MPEG2 DECODER : DSN=789" } K3

FIG.8F

"MPEG2 DECODER : DSN=789"

FIG.9

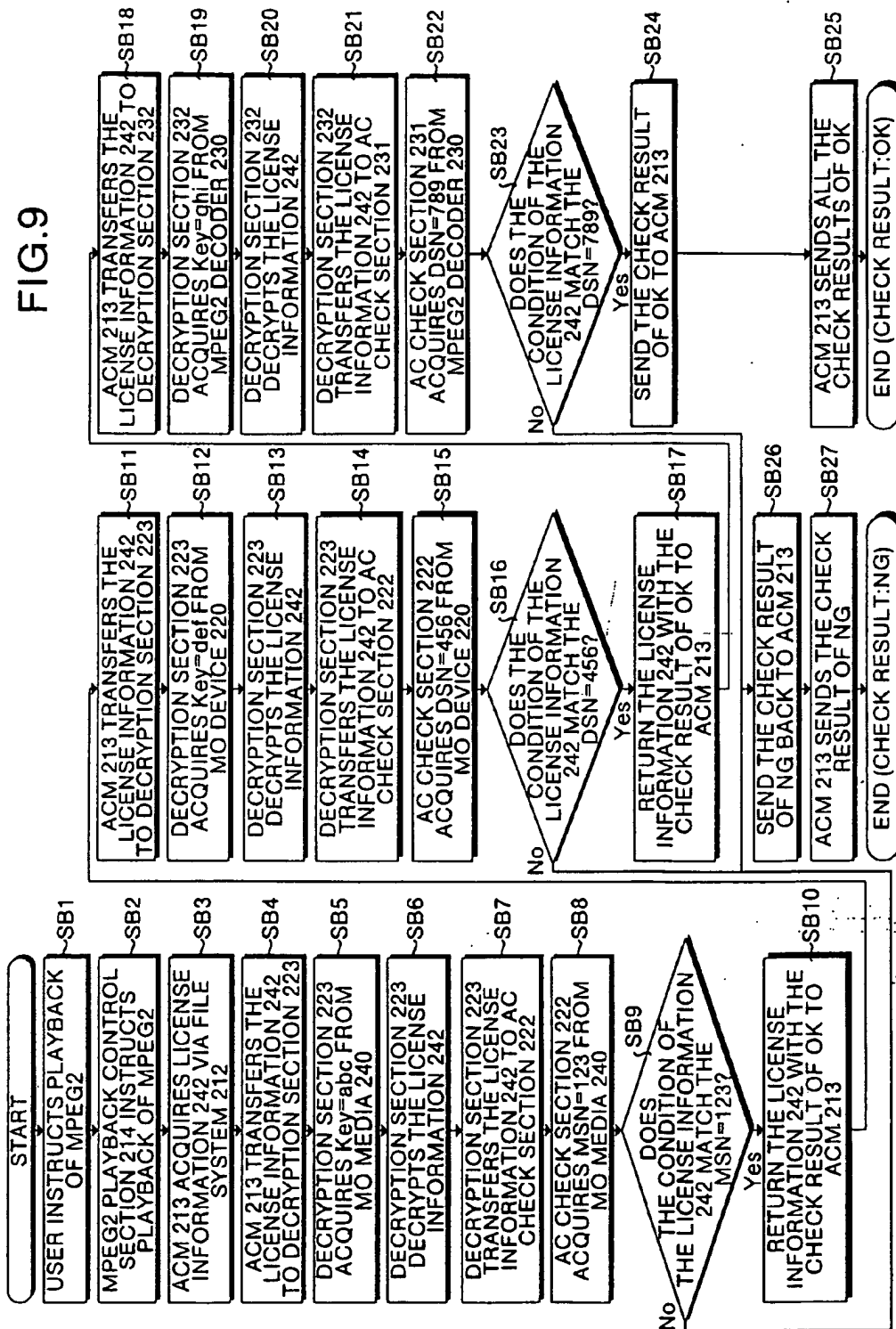


FIG.10

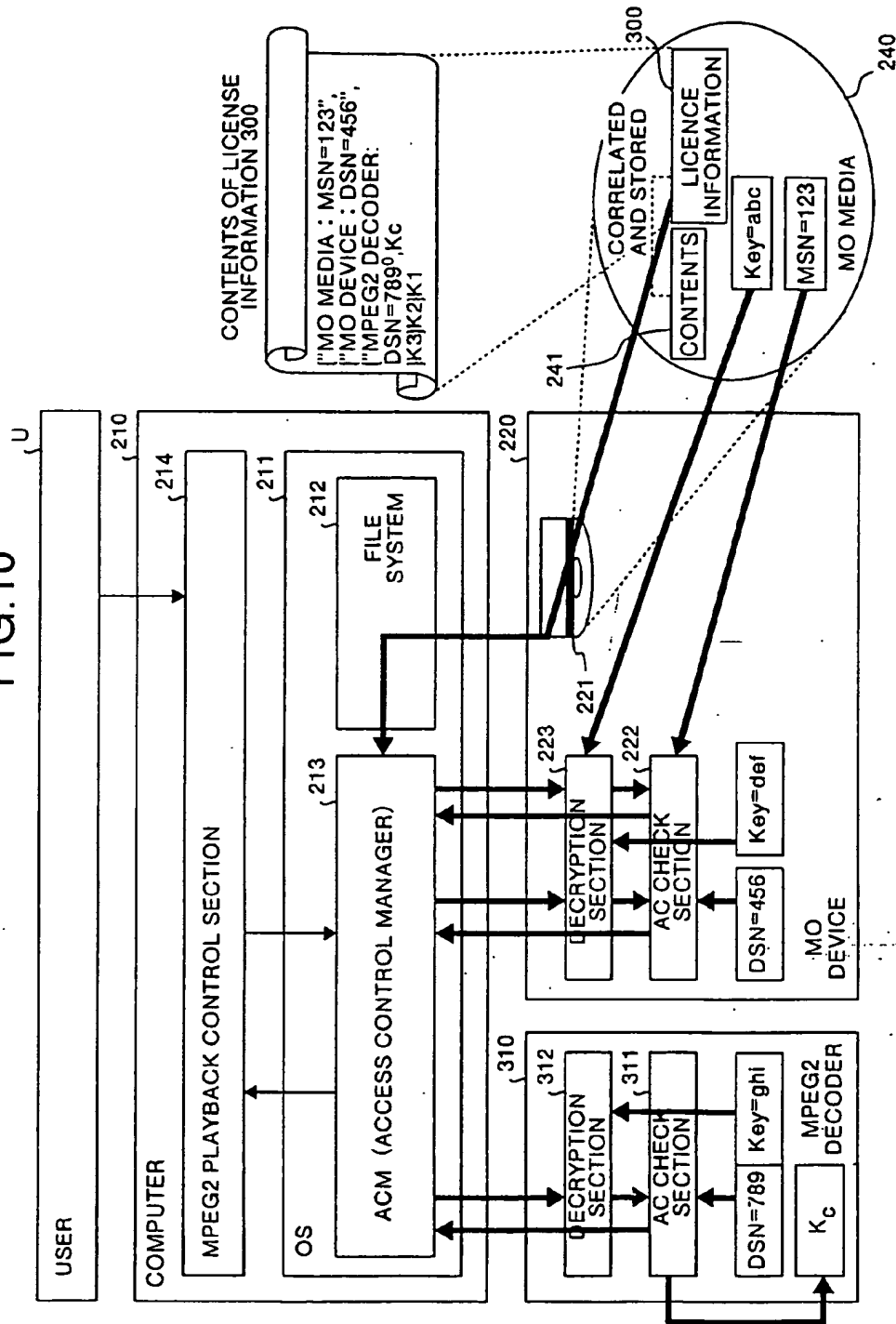


FIG.11

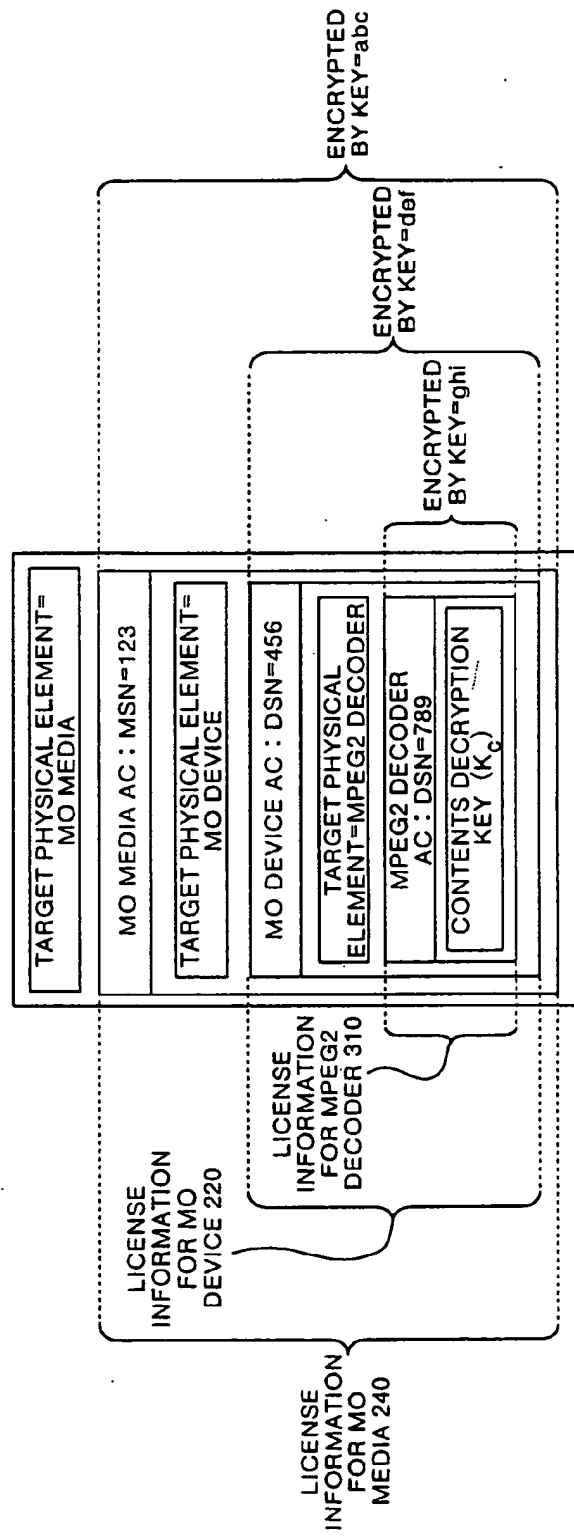


FIG.12A

{ "MO MEDIA : MSN=123" , { "MO DEVICE : DSN=456" , { "MPEG2 DECODER : DSN=789" ,Kc} K3} K2} K1

FIG.12B

"MO MEDIA : MSN=123" , { "MO DEVICE : DSN=456" , { "MPEG2 DECODER : DSN=789" ,Kc} K3} K2

FIG.12C

{ "MO DEVICE : DSN=456" , { "MPEG2 DECODER : DSN=789" ,Kc} K3} K2

FIG.12D

"MO DEVICE : DSN=456" , { "MPEG2 DECODER : DSN=789" ,Kc} K3

FIG.12E

{ "MPEG2 DECODER : DSN=789" ,Kc} K3

FIG.12F

"MPEG2 DECODER : DSN=789" ,Kc

FIG.13

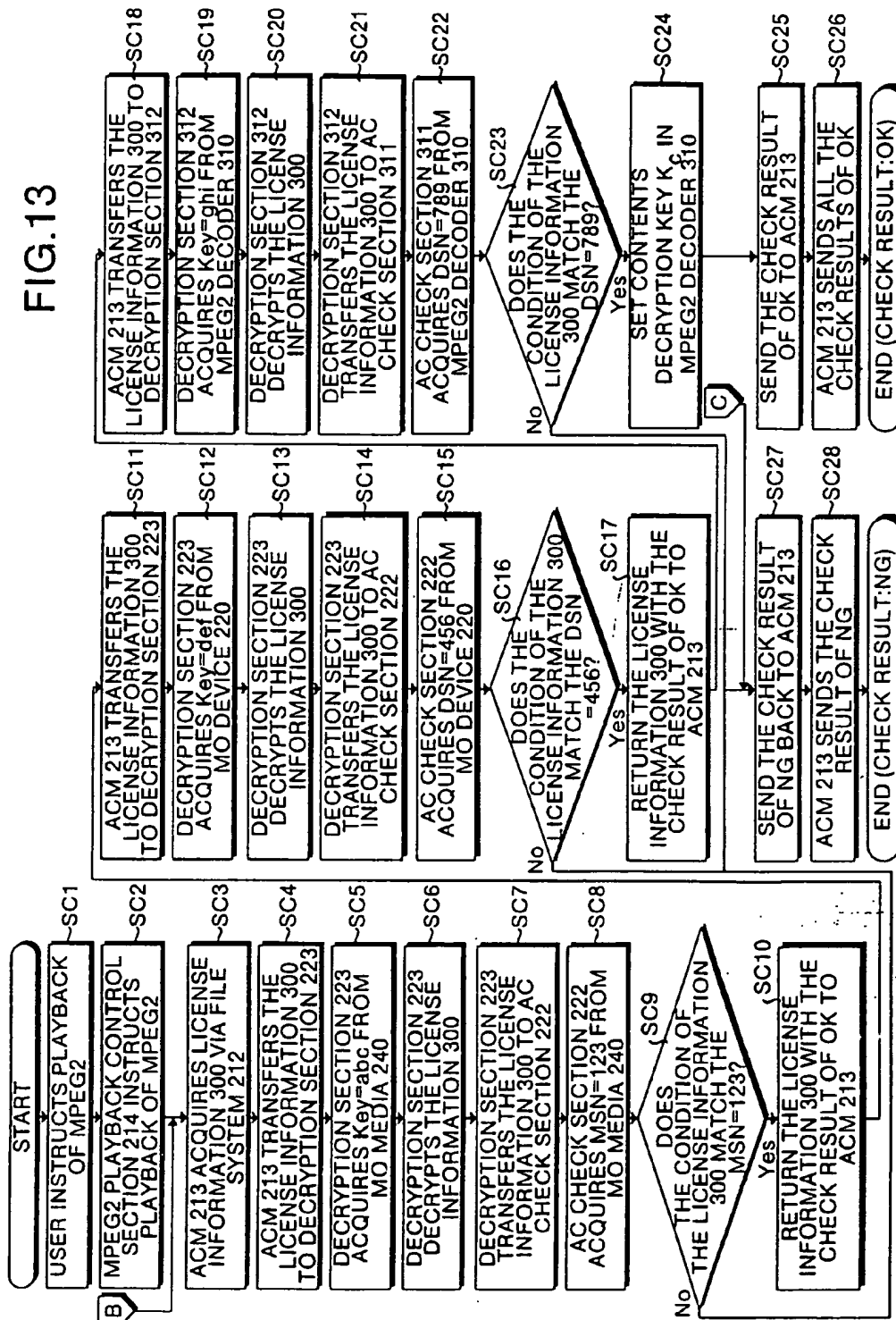


FIG.14

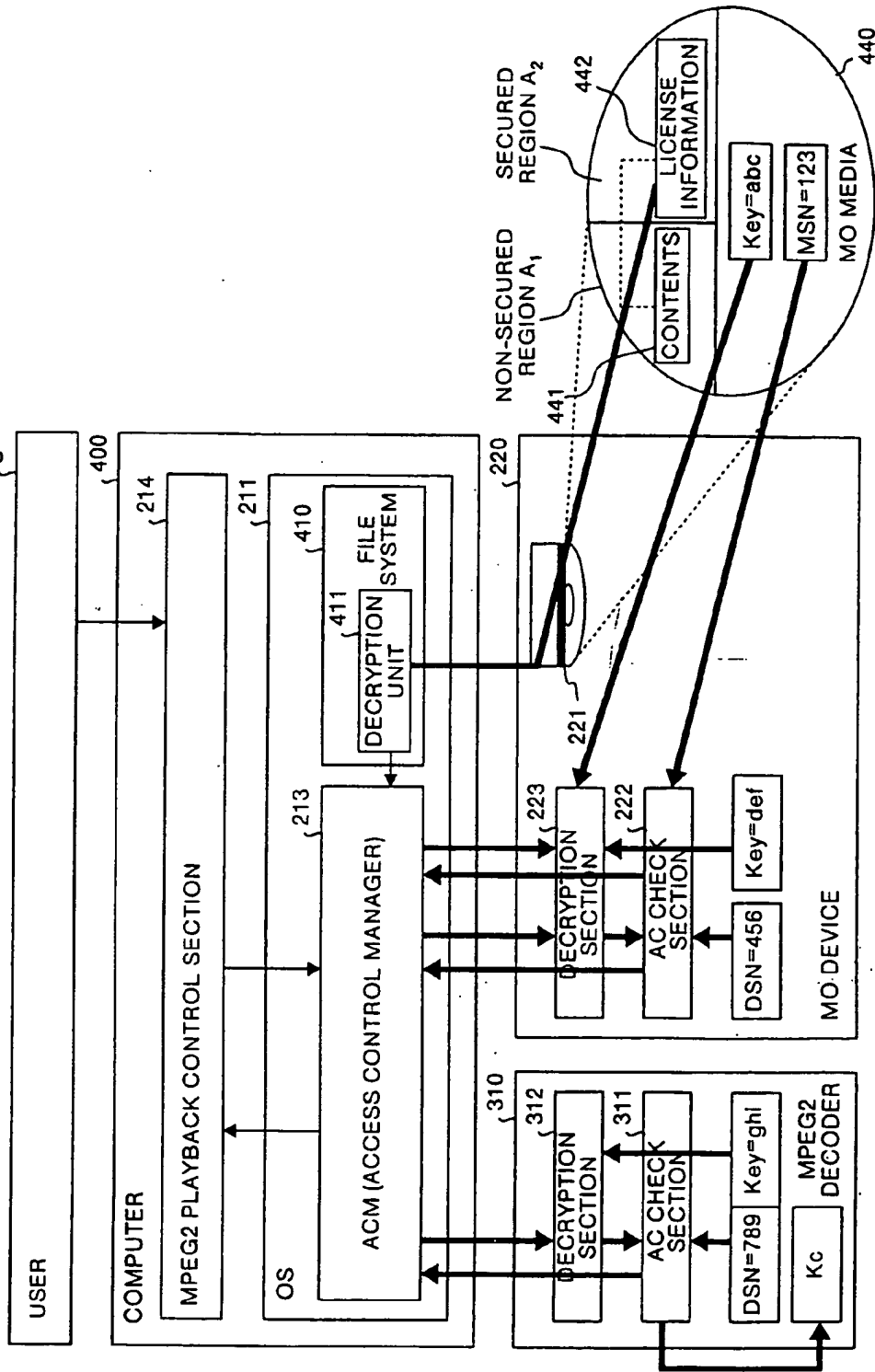


FIG.15

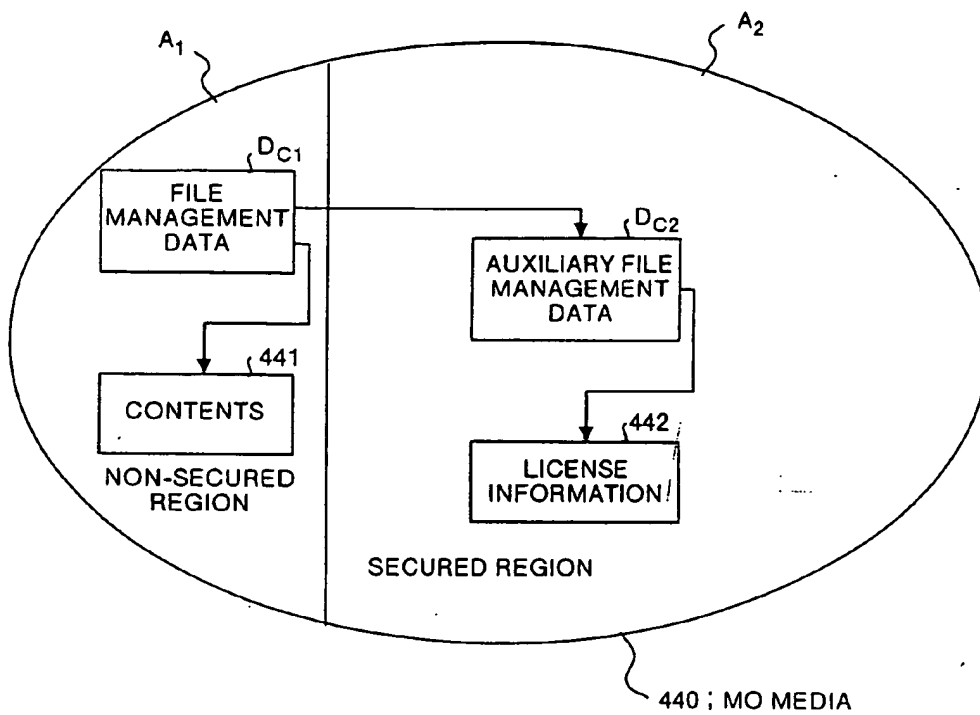


FIG.16

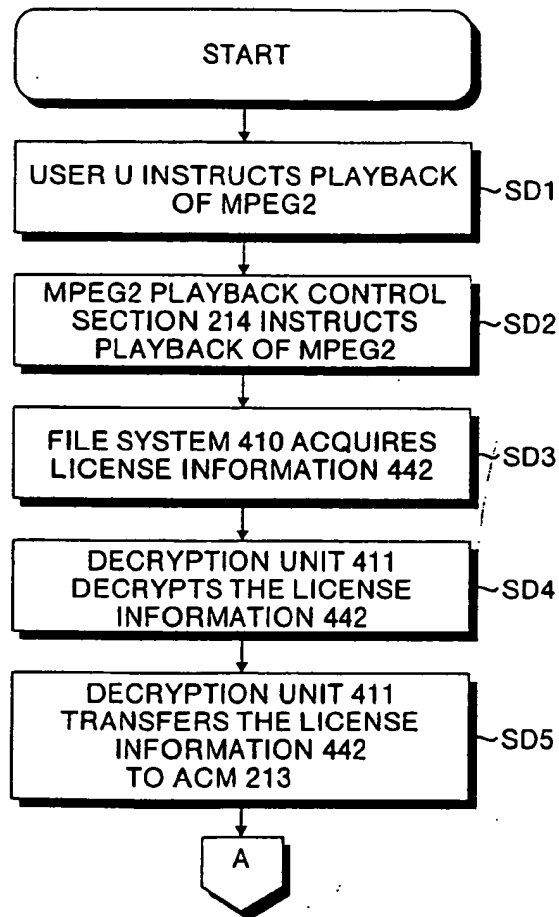
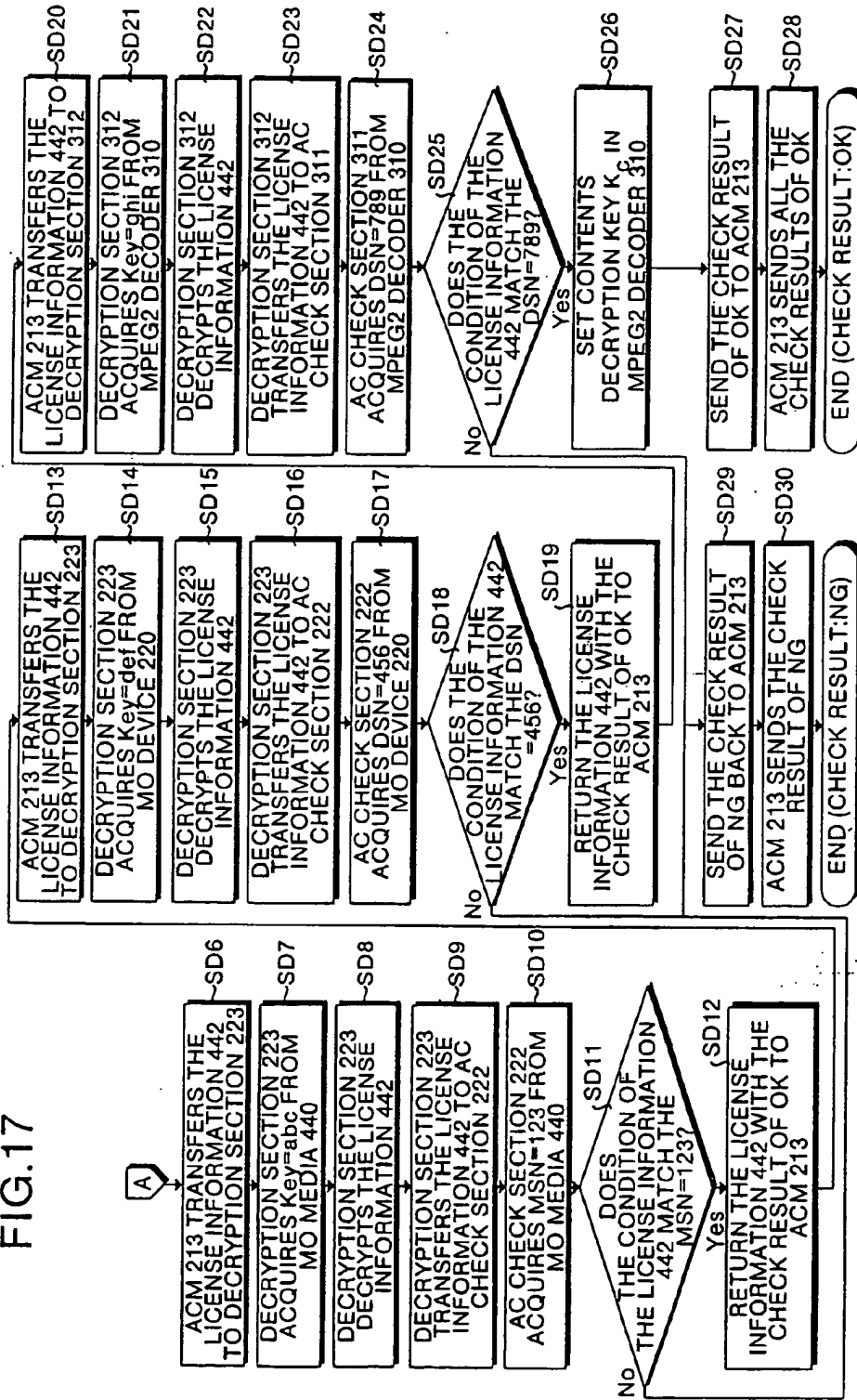


FIG.17



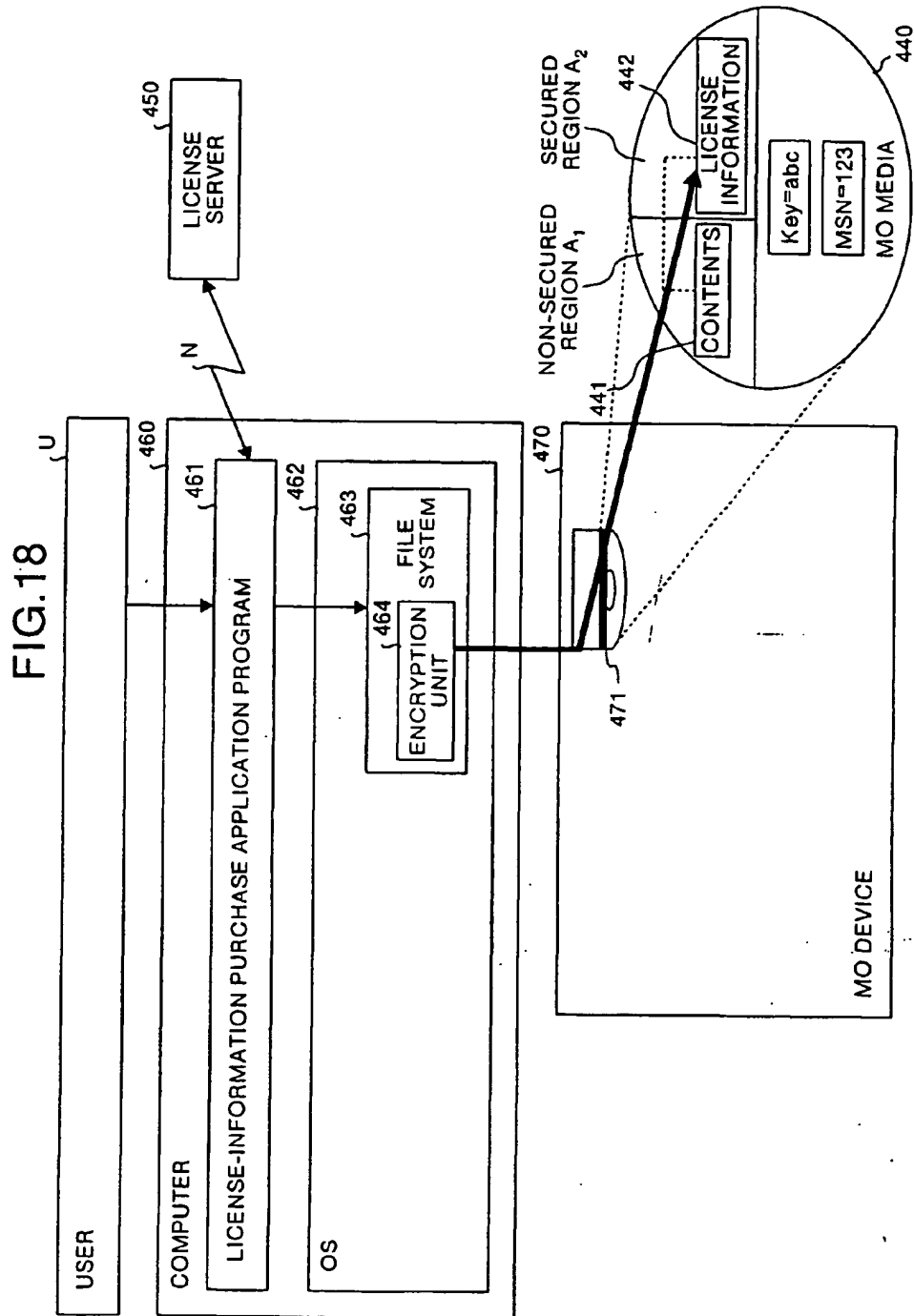


FIG.19

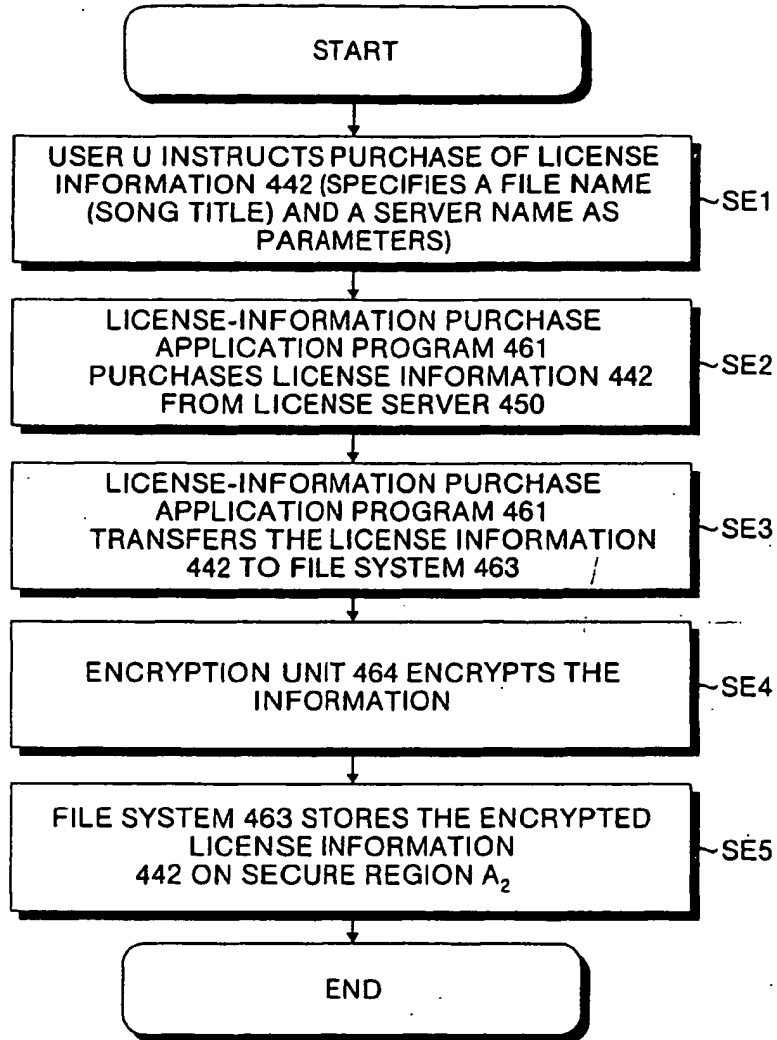


FIG.20

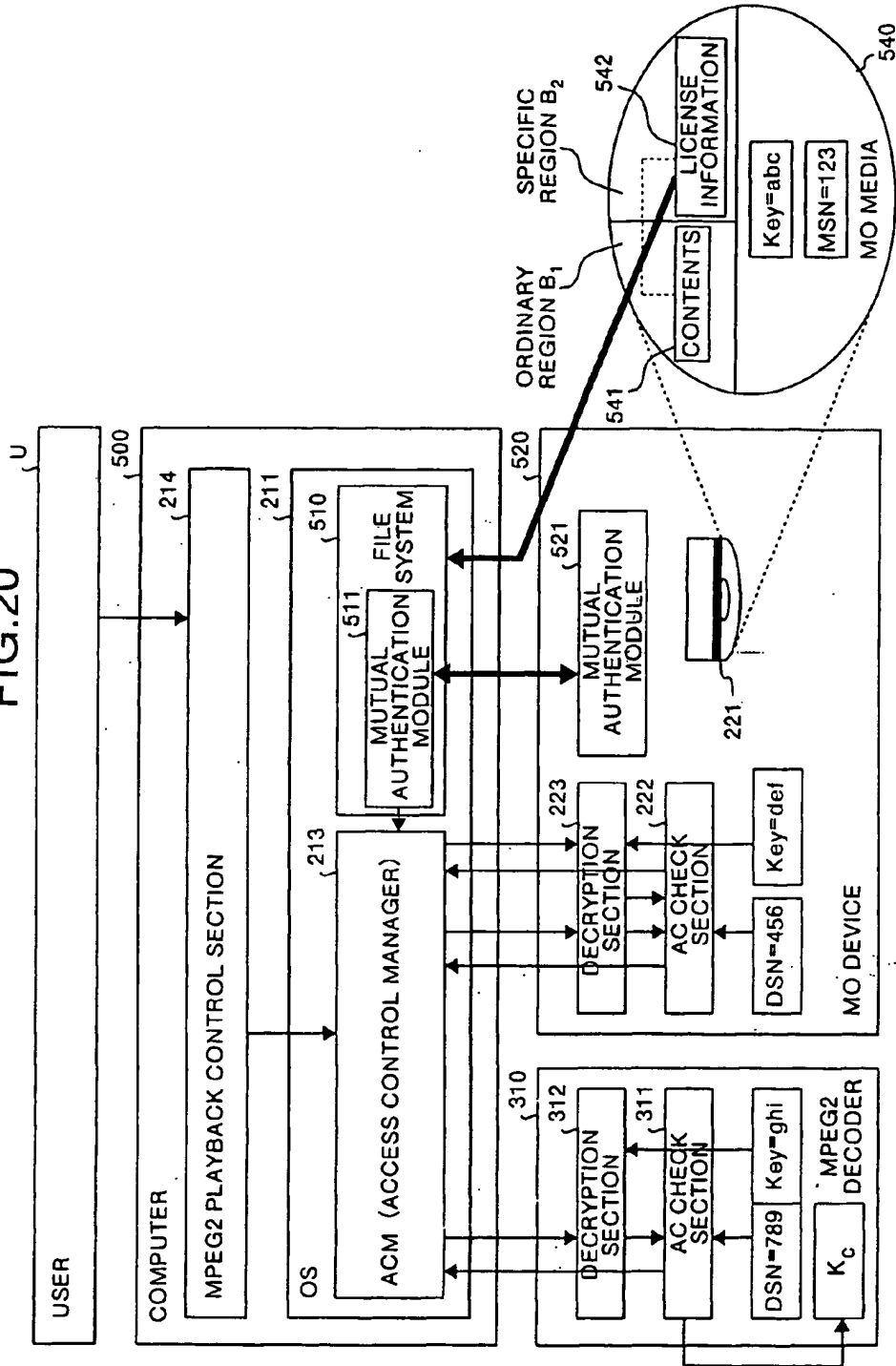


FIG.21

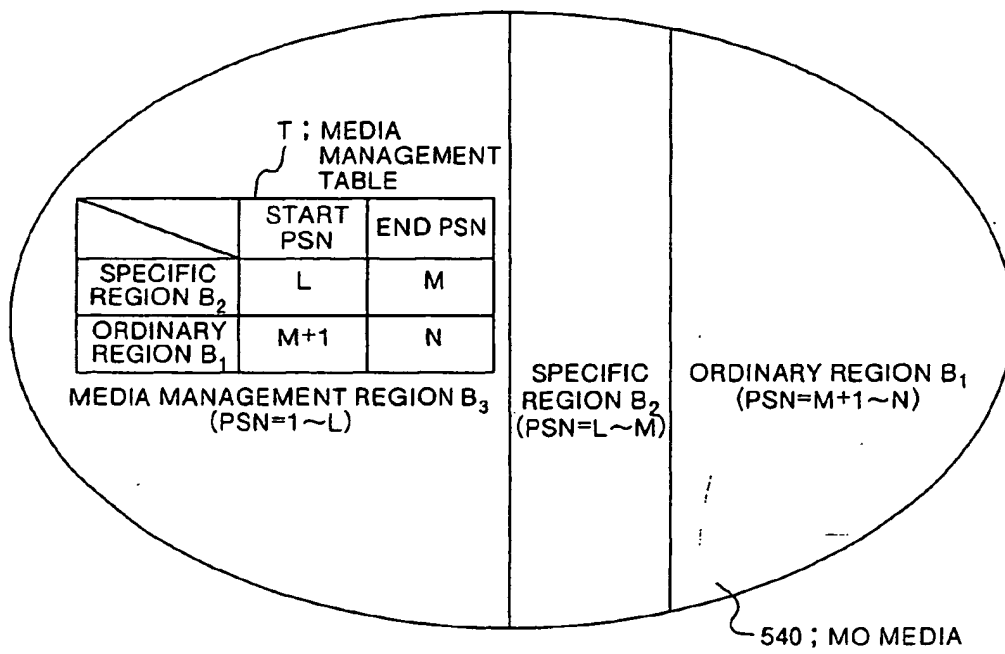


FIG.22

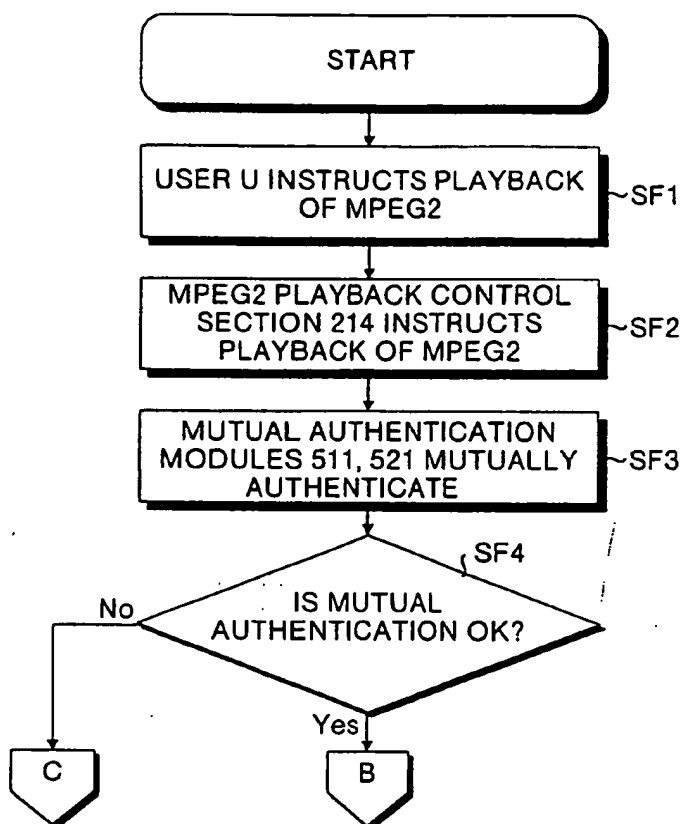


FIG.23

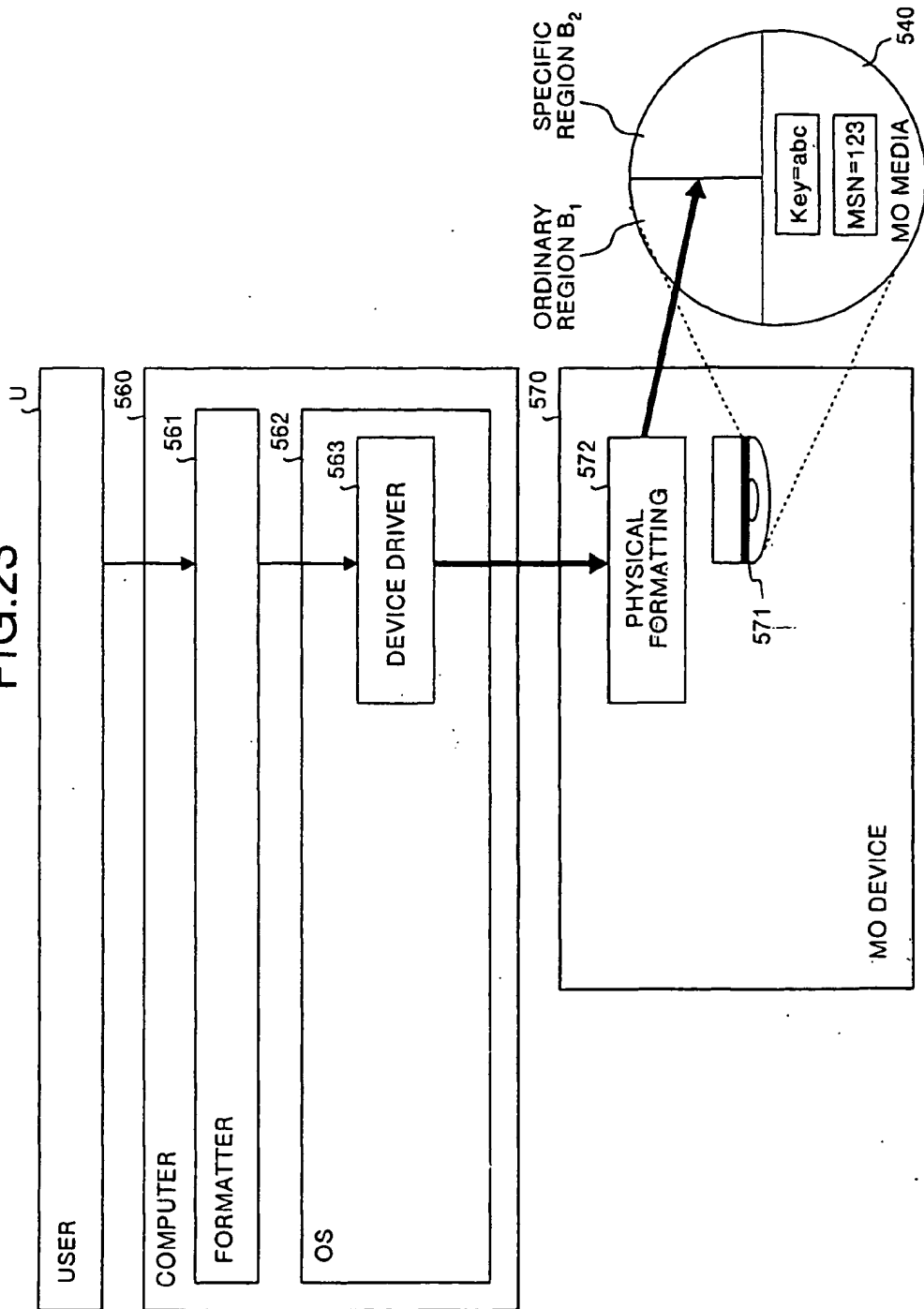


FIG.24

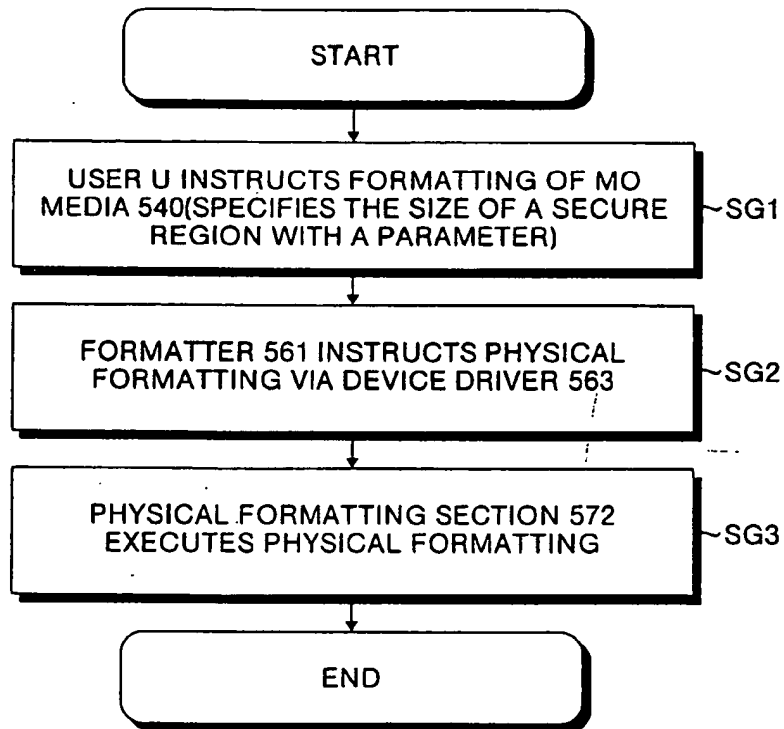


FIG.25

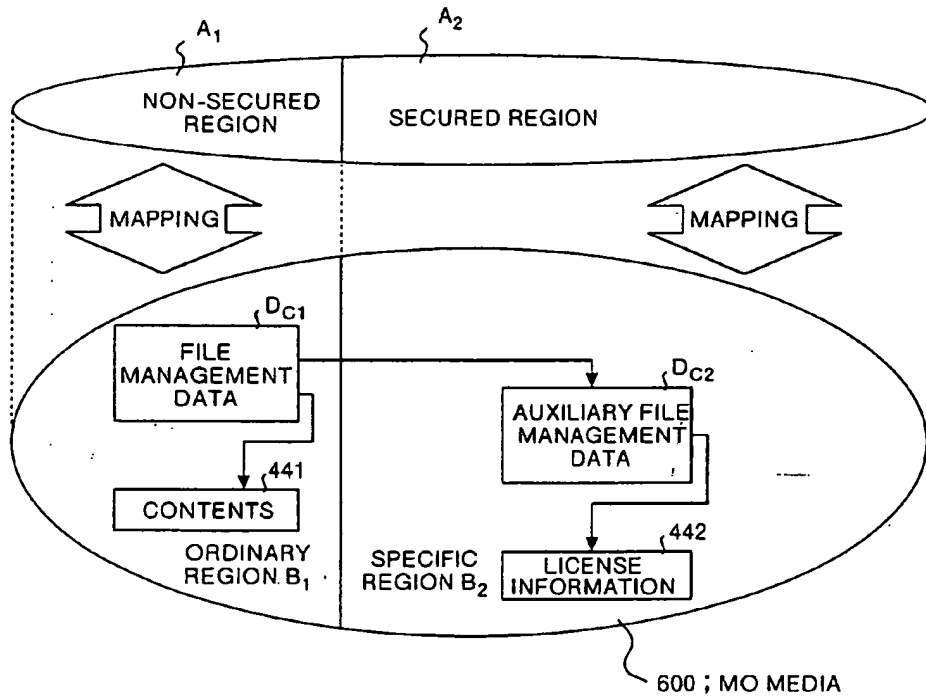


FIG.26

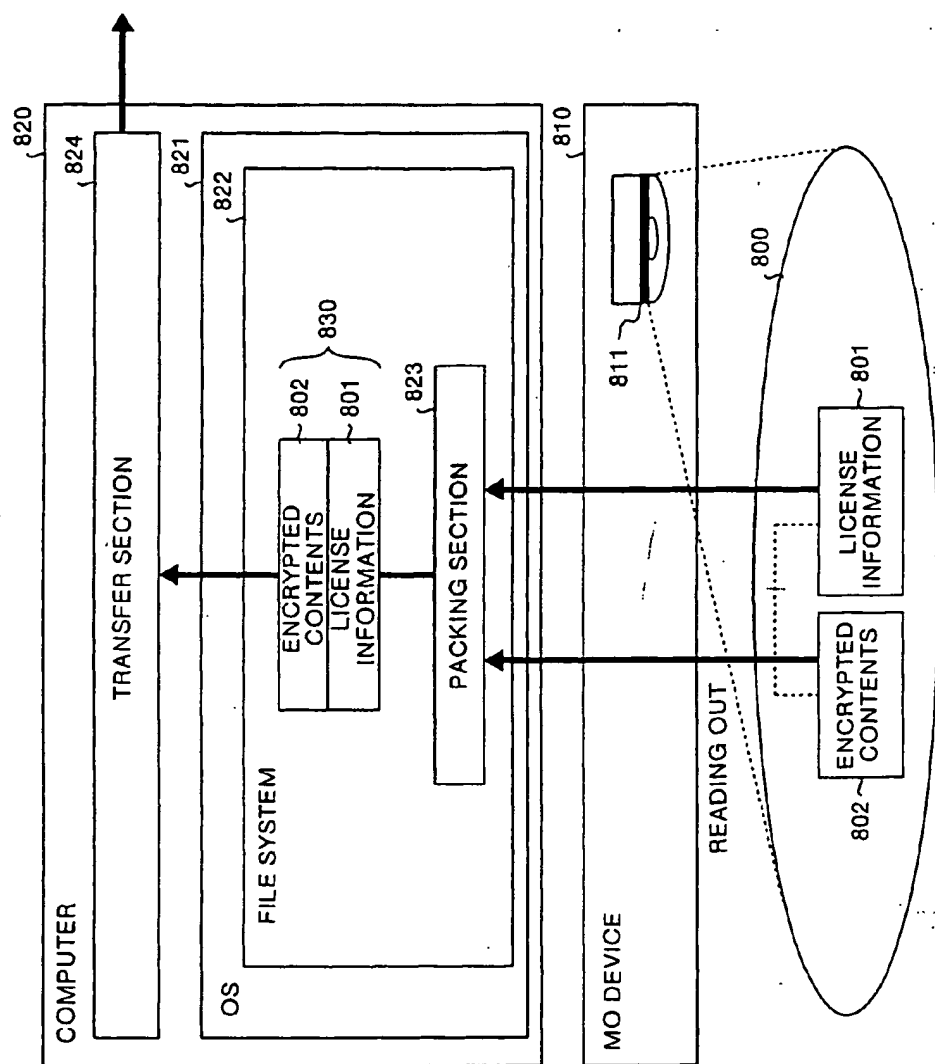
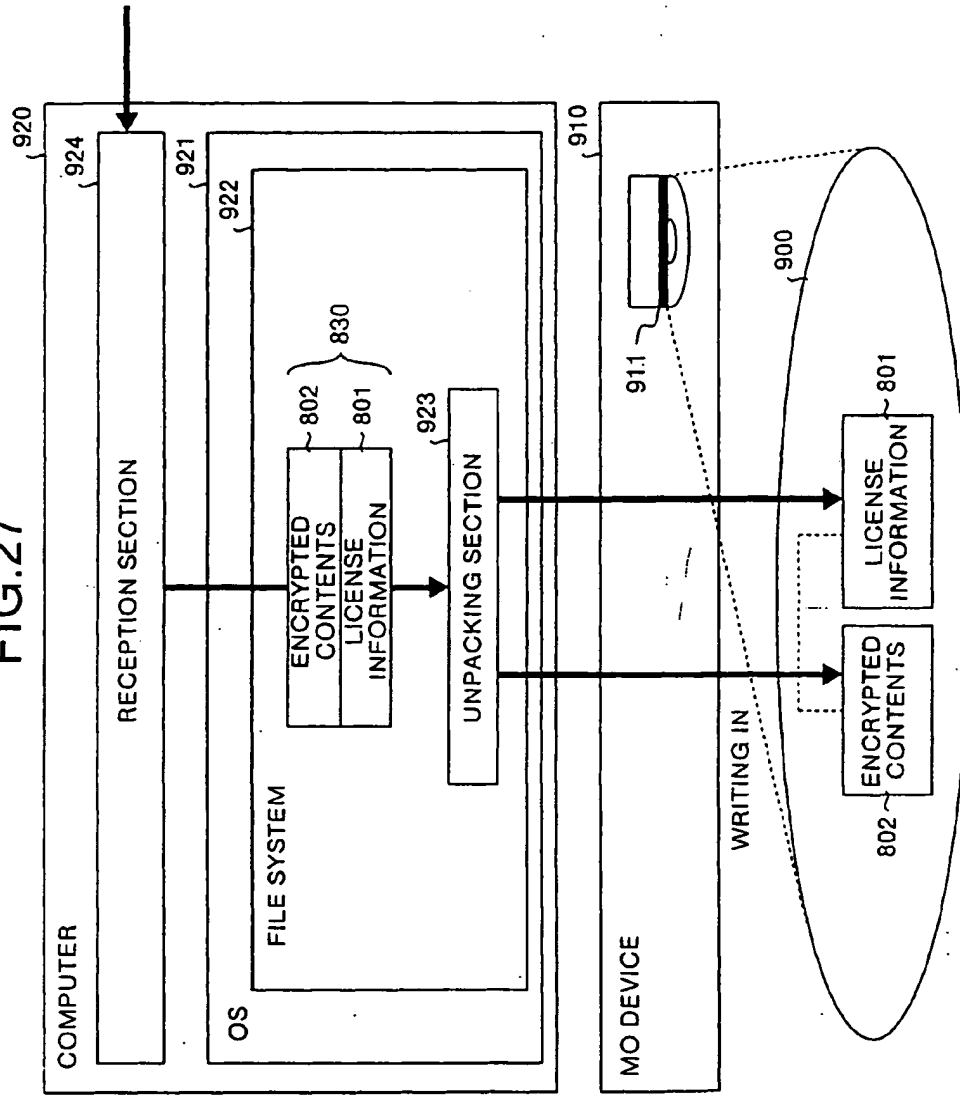


FIG.27



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